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VOL. XXXI ST. LOUIS, MARCH, 1921. No. 3

ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding that they are contributed exclusively to THE LARYNGOSCOPE.)

RESULTS OBTAINED FROM ONE YEAR'S USE OF THE AUDIOMETER IN THE OTOLOGICAL CLINIC.*

DR. L. W. DEAN AND MR. C. C. BUNCH, Iowa City, Iowa.

In order to justify the use of new diagnostic methods, it is necessary to demonstrate that they will either present evidence hitherto unobtainable or that they will present the evidence obtained by former procedure in a more definite and satisfactory manner. The use of the Pitch Range Audiometer in the otological clinic has been justified from both viewpoints. The results of tests are definite and easy of interpretation. They are capable of immediate verification. The presence of unsuspected gaps and islands in the range tested is easily ascertained.

In the otological clinic during the past year the audiometer has been used in testing all of the more difficult otological cases and a series of cases embracing the more common ear diseases. It has not been used in all the cases because it was desirable to check the findings secured with the audiometer in each case. In each case the tuning fork tests were made by two different individuals and the results secured compared with the findings of the audiometer. This required so much time that it was not possible to test all cases. In all, two hundred cases were tested and results checked. Some cases were tested eight or ten times. In a number of cases the

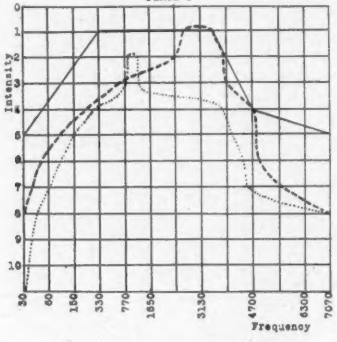
*Read before the Fifty-third Annual Meeting of the American Otological Society, Boston, May, 1920.

results of one of the two examinations with the tuning fork did not agree with the findings of the audiometer. In every case where there was a difference careful examination was made by Dr. Dean and the audiometer findings were always found to be correct while the tuning fork tests were at fault.

One examination with certain forks from the Bezold set was made by a clinical assistant; the examination with the audiometer and the second tuning fork test was made by Mr. Bunch. The audiometer used had a range from thirty to seven thousand seventy double vibrations. Mr. Bunch is now using in the psychological laboratory a machine with a range of from twenty-five to fourteen thousand double vibrations. A similar machine is being prepared for the clinic.

The time necessary for the complete examination with the audiometer averages fifteen minutes. This includes the time required

PLATE I



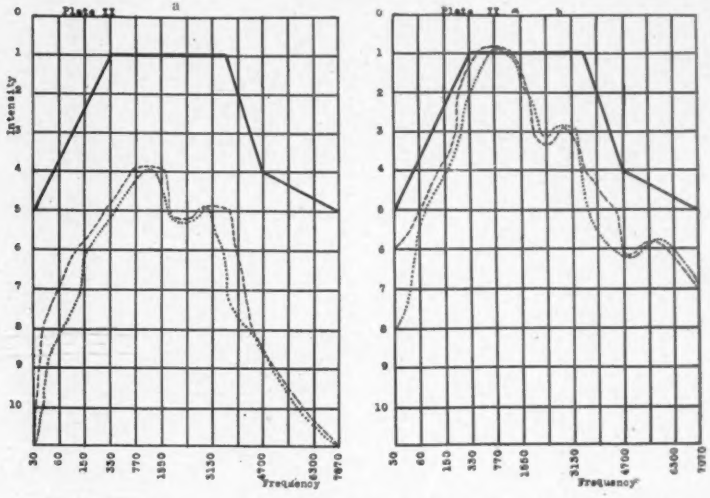
for such oral instructions as are necessary and for writing up the record. Any intelligent individual can make the tests. This very thorough testing of the audiometer has convinced us of its accuracy and reliability. From now on the examination with the audiometer will take the place of certain of the tuning fork tests in our clinic. The examinations will be made by the assistants and internes.

The only instruments so far made are those which have been prepared in the psychological laboratory. We are not fortunate enough to have an instrument in rooms for private cases. We have become so dependent upon this instrument that with many of the rather difficult cases in private practice we have felt that we were not prepared to render definite opinion until the tonal range had been tested with the audiometer. This has been of particular value in diagnosing oto-sclerosis in a patient that has had previously

a suppurative otitis resulting in marked cicatricial changes in the tympanum.

The charts which we wish to present show first the accuracy and reliability of the records in comparison with other clinical tests.

The solid line at the top of the page indicates the average tentative curve for ears known to be normal. The figures at the bottom indicate the range of frequencies which are produced. The numbers at the left indicate the intensities, faint tones being produced on step 1 and louder ones toward the bottom of the chart. For convenience we have indicated the curve for the right ear by lines of dashes and that for the left by dotted lines.



In all of these charts, the record of the audiometer test is more comprehensive. The questionable diminution for high tones is amply verified. The factors of error in the tuning fork and the voice tests are such that even the examiner often questions his findings. Often patients who claim better hearing in one ear than the other have had it demonstrated by interchange of the telephone that certain tones may be heard better in the so-called poorer ear. The audiometer determines exactly where differences occur.

The first aim of our research was to determine the possibility of indicating a normal curve for various ear lesions, but the results varied so widely with the progress of the infection that this was found impossible. The distinguishing characteristic was shown to be the *shape* of the curve rather than its *height* on the chart.

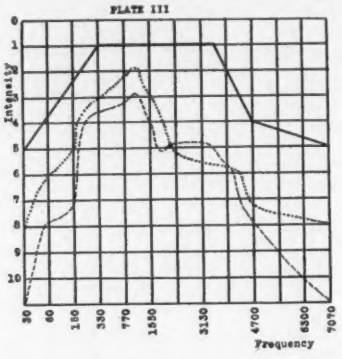
For example, it is easy to understand that results from an old acute condition would be much more marked than in a similar one of recent occurrence, but the same general trend would be observed.

Plate I. Otitis media sicca left.

Chart shows audition for low notes much diminished; for high just slightly diminished.

	50 d. v.	128	256	512	1024	2048	4096
Left	0	2	6	12	24	36	60
	4	4	8	12	24	36	60

Plate II. Tubal catarrh. Plate IIa shows the curve before inflation, and Plate IIb the curve after.



Hearing before inflation: Right whisper 2 feet, spoken voice 5 feet. Left whisper 1 foot, spoken voice 5 feet.

	50 d. v.	128	256	512	1024	2048	4096
Right	1	3	10	15	20	25	30
	2	6	12	18	24	36	60
Left	1	3	10	15	20	25	30
	2	6	12	18	24	36	60

Hearing after inflation: Right whisper 30 feet, spoken voice 60 feet. Left whisper 30 feet, spoken voice 60 feet.

	50 d. v.	128	256	512	1024	2048	4096
Right	2	6	12	18	24	36	60
	2	6	12	18	24	36	60
Left	2	6	12	18	24	36	60
	2	6	12	18	24	36	60

Note the increase in audition for all notes resulting from the ventilation of the tympanum.

Plate III. Bilateral recurring otitis media suppurative.

Hearing: Right whisper 4 feet, spoken voice 20 feet. Left whisper 4 feet, spoken voice 30 feet.

In the right ear the curve shows a marked decrease in the audition for high and low notes. In the left ear the decrease is not so marked.

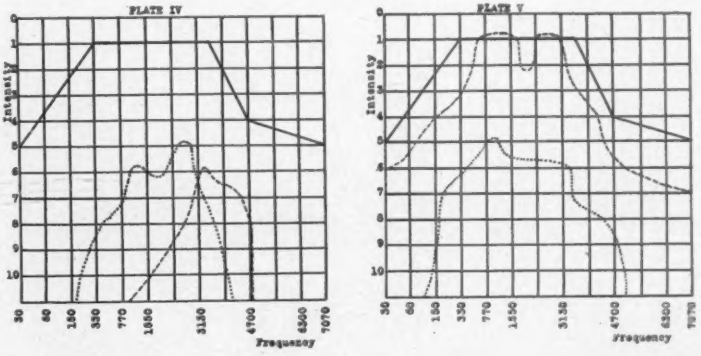
Plate IV. Bilateral otitis media suppurativa chronica with involvement of inner ear.

Note the marked decrease in high as well as low notes.

Hearing: Right whisper 6 inches, spoken voice 8 feet. Left whisper 6 feet, spoken voice 8 feet.

Each ear Rinne negative; bone conduction decreased; right six seconds, left four seconds. The Galton whistle, Koenig cylinders and monochord indicate a lowering of the upper tone limit. The tuning forks show an elevation of the lower. Vestibular reactions were normal.

Plate V. Right otitis media suppurativa chronica. Left otitis media suppurativa residua inner ear lesion.



Hearing: Right whisper 15 feet, spoken voice 45 feet. Left whisper 4 feet; spoken voice 12 feet.

The curve for the right ear shows slight diminished audition for both high and low notes. The curve for the left marked diminution for high and low notes. Bone conduction right is normal; left diminished one second.

With lesions of the conductive apparatus of the ear the audiometer curve has shown constantly some diminution in audition for high notes. Sometimes the diminution is due to a pure conductive lesion. It is so marked that an inner ear complication is suggested. To show the influence of a pure conductive lesion on the curve two individuals with apparently normal ears were tested

before and after packing the external auditory canal with boric acid powder.

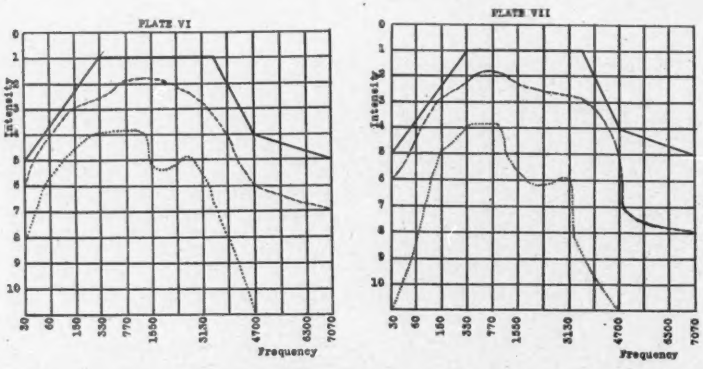
Plate VI. Before packing the external auditory canal with boric acid powder. . . . . After packing.

Plate VII. Same as Plate VI.

Note the curves after packing show a distinct diminution in audition for high notes as well as the low. These two curves show that the audiometer, like the tuning forks, is only an aid in diagnosis of aural lesions. A proper diagnosis can only be made by considering also the results of the usual diagnostic tests.

Plates VIII and IX.

These plates show the curves before and after the removal of a piece of cotton deep in the left external auditory canal. This case



was a soldier just returned from France. The only complaint was tinnitus aurium.

Hearing: Left whisper 15 feet, spoken voice 45 feet.

The cotton was lost in the ear evidently several months before when patient was in France. With the hearing practically normal the foreign body still produced a slight diminution in the power of hearing high notes.

Plate X. Otosclerosis.

The left curve shows the tone gap which we have found so frequently in this disease.

Plate XI. Otosclerosis.

This patient, aged 25, complained mostly of tinnitus. She had but little difficulty with the hearing. Examination showed prac-

tically normal hearing. The curve shows in the left the marked diminution of audition for low notes.

Plate XII. Bilateral otitis media suppurativa residua slight with neuro-labyrinthitis syphilitica.

There is a distinct tone gap in the left ear. 2048 fork heard in the left only at great intensity; somewhat better in the right. 4096 fork heard very poorly in each.

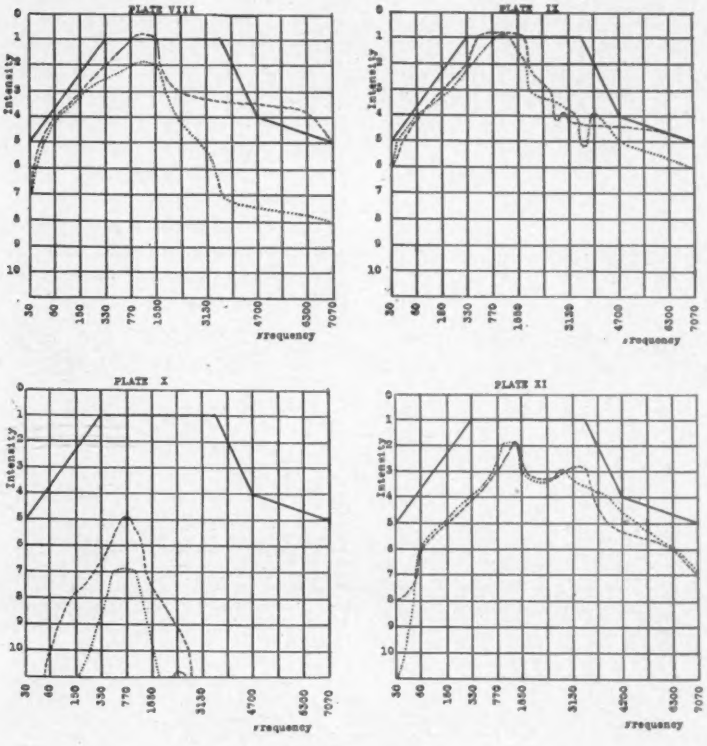


Plate XIII. Neuritis acustica syphilitica.

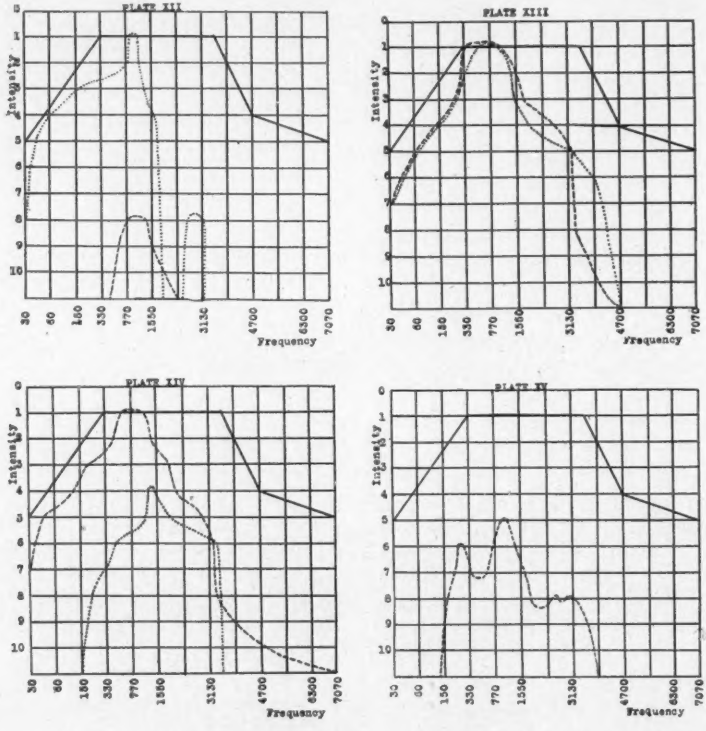
Hearing: Right whisper 15 feet, spoken 45 feet. Left whisper 15 feet, spoken 45 feet.

Patient gave no history of ear trouble. The ears were examined because of the presence of active syphilis. The high notes are distinctly diminished. The area corresponding to the human voice

(about 1000 d. v.) was almost normal. The upper tone limit was but slightly diminished.

Mr. Bunch in his work with students in the School of Music, and with students in United States Radio School has discovered a number of cases of unsuspected acoustic neuritis.

Plate XIV. Bilateral neuritis acoustica secondary to brain tumor; probable brain-stem lesion.



Hearing: Right whisper 15 feet, spoken voice 45 feet. Left whisper 12 feet, spoken voice 40 feet.

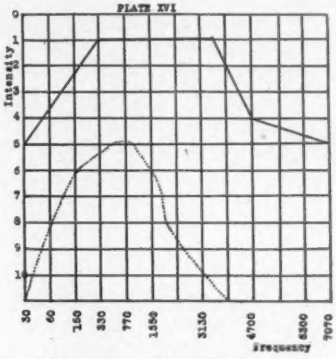
Both high and low notes are cut down in the left ear. For the same fork the hearing right is diminished. Vestibular reactions are almost lost.

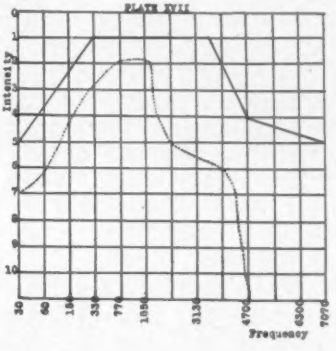
Plate XV. Bilateral neuritis acoustica secondary to syphilis of the brain hemiplegia left.

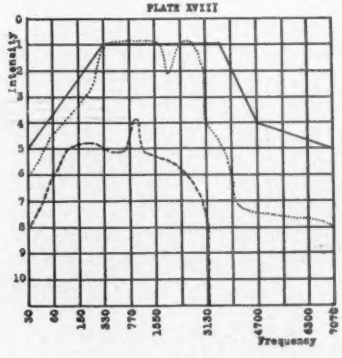
Hearing: Right whisper 12 feet, spoken voice 45 feet. Left whisper not heard, spoken voice not heard.

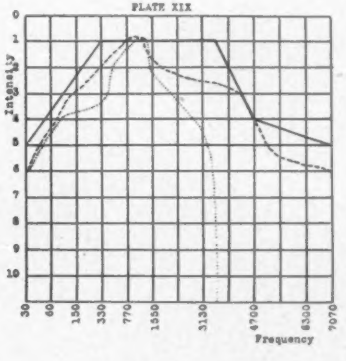
Shows a curve for the right ear with audition for both high and low notes cut down. In this case the vestibular reactions were but slightly subnormal.

Plates XVI. and XVII.









These plates show the curve of a case of hysterical deafness left ear, preceding and following an electrical treatment with suggestion. Before the treatment the hearing left was very loud voice in 2 feet. The curve shows audition for all notes cut down; the high and low notes are particularly affected. The curve is somewhat similar to the gun barrel perimetric fields in hysteria.

After treatment the hearing left was whisper 15 feet, spoken voice 45 feet.

The curve indicates increased hearing for all notes in the range from 30 to 4700. Beyond 4700 the hearing is still affected.

An attempt was made to get a fatigue chart of this patient but it was not successful. In some cases of war neurosis the repeated examination has shown diminished audition with each consecutive test.

Plate XVIII. Fracture of the skull.

April, 1918, fracture of skull. Unconscious for two weeks.

April 22, 1919, one year after said hearing right ear had been bad since the accident. At this time hearing right, whisper 4 feet, spoken voice 20 feet. Caloric test no reaction.

On February 3, 1920. Right whisper 1 foot, spoken voice 10 feet. Caloric test positive.

The curve was secured on February 10, 1920. The high notes are very poorly heard in the right; somewhat diminished in the left.

Plate XIX. Concussion deafness.

Following explosion of hand grenade, unconscious for two minutes; hearing gone for one week. There was a gradual return of hearing until at the time of examination there was just a little defect in the left ear.

Hearing: Right whisper 20 feet, spoken voice 60 feet. Left whisper 20 feet, spoken voice 60 feet.

This patient was very anxious that no defect should be found present. The audiometer showed the defective audition for the high notes left.

The records presented are typical of the findings in a wide variety of ear cases. The test is imperfect in so far as it fails to cover the entire range of audible tones. The definiteness and accuracy of the information secured in conducting the test, the maximum attention with minimum of fatigue due to listening to a constantly changing sound, the new information derived, these in connection with the opening of new fields of research amply justify the use of the audiometer.

SOME OF THE MORE IMPORTANT MEASUREMENTS OF PARTS OF THE TEMPORAL BONE.*

DR. EMIL AMBERG, Detroit, Mich.

In their article, Iatro-Mathematics, George Dreyer and E. W. Ainley Walker (Contribution to Medical and Biological Research, dedicated to Sir William Osler, 1919, Vol. 1, p. 47) quote Stephen Hales (1727) who said:

"Since we are assured that the All Wise Creator has observed the most exact proportions of number, weight and measure in the make of all things, the most likely way to get any insight into the nature of those parts of the creation which come within our observation must, in all reason, be to number, weight and measure. And we have much encouragement to pursue this method of searching into the nature of things from the great success that has attended any attempts of this kind."

An immense amount of data is found in many publications, e.g. in Schwalbe's Textbook of the Anatomy of the Ear, in Jankau's Pocketbook for Ear, Nose and Throat Physicians—a much more thorough and extensive review than I am able to give, and from which I quote very liberally. My object is to mention only very few of the more important measurements referring to the anatomy.

1. *Outer Ear Canal.*

Politzer gives the following data:

Length of upper wall	21 mm.
Length of lower wall	26 mm.
Length of posterior wall	22 mm.
Length of anterior wall	27 mm.

The length of the external auditory canal in the child, according to Symington (Internat. Zentral-Blatt f. Ohrenheilkunde 1907, p. 113: Jankau l. c. p. 80) is:

Age	Floor	Roof
2 months	17 mm.	13 mm.
6 months	19 mm.	14 mm.
1 year	20 mm.	15 mm.
2 years	22 mm.	16 mm.
5 years	23 mm.	17 mm.
6 years	24 mm.	17 mm.

*Read before the American Otological Society, Boston, May, 1920.

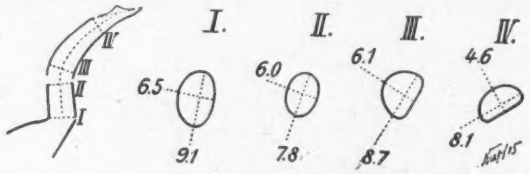
According to Bezold (Schwartze's Textbook, page 7), the diameters of the ear canal are as follows:

	Large Diameter	Small Diameter
Beginning of cartilaginous canal	9.0 mm.	6.5
End of cartilaginous canal	7.7 mm.	5.9
Beginning of osseous canal	8.6 mm.	6.7
End of the osseous canal	8.1 mm.	4.6
Drum membrane	11.0 mm.	9.0 (Schwalbe)

Politzer mentions them as being:

At the porus acusticus externus	12 mm.	10.
In the middle of the osseous canal	9 mm.	5.
At the inner end of the osseous canal	10 mm.	4.

Hummel (Jankau l. c. page 79) gives the average capacity of the external meatus on the right side as 1.07, on the left side 1.05 cubic



Section through the meatus perpendicular to its axis.
I at the entrance, *II* at the end of the cartilaginous part, *III* at the beginning of the bony part, *IV* at the end of the bony part. (Ez 70 II, page 37).

Fig. 1.

centimeters. The thickness of the skin in the cartilagenous portion is 1-2 mm. The thickness of the skin on the posterior wall is 0.5 mm.

2. *Drum Membrane.* Schwalbe (Textbook of the Anatomy of the Ear, part edition of the author's Textbook of the Anatomy of the Organs of Sense, 1887) gives minute measurements of many parts of the ear. He mentions that the drum membrane reaches its maximum almost at birth.

The dimensions, according to von Troeltsch, are as follows:

11 weeks, height of the drum membrane 2 mm., width 1¼ mm.
14 weeks, height of the drum membrane 3 mm., width 2 mm.
16 weeks, height of the drum membrane 4½ mm., width 3 mm.
20 weeks, height of the drum membrane 7 mm., width 5½ mm.
22 weeks, height of the drum membrane 8 mm., width 7 mm.
24 weeks, height of the drum membrane 8½ mm., width 8 mm.
7 months, height of the drum membrane 9 mm., width 8 mm.
8 months, height of the drum membrane 8½ mm., width 8 mm.
9 months, height of the drum membrane 9¾ mm., width 8½ mm.

Schwalbe claims for the apparent decrease in the eight month individual differences.

The thickness of the drum membrane, according to Henle (Jankau l. c. p. 80) is 0.1 mm., the size of the surface 69¼ square mm.

According to Schwalbe (l. c. page 451) the thickness of the stria malleolaris is much greater than that of the transparent portion of the membrana tensa. In the stria malleolaris it is 0.4 mm., while in thinnest spots it is 0.1—0.16 mm.

The epidermis of the drum membrane according to Schwalbe (page 452) is 40/1,000 mm. thick and consists of several epithelial layers; the layer immediately adjacent to the connective tissue consists of cylinder cells, then follow 5-6 layers polyedric cells rich in albumen and at last 3-4 layers of flat squamous cornified cells, which easily scale, but which are distinguished from ordinary cornified cells by possessing nuclei. The cutis of the drum membrane in its transparent portion is thinner than the epithelial covering, only 16-20/1,000 mm.

3. *Tympanic Cavity, Including the Epitympanic Cavity.* According to Schwalbe (l. c. page 466) the height of the tympanic cavity is the greatest at the posterior end. It is 15 mm. of which 6 belong to the recessus and 9 to the tympanum proprium. The greatest height of the latter is 10-11 mm. (Bezold 10.5-13 mm.). The height of the anterior wall to the entrance of the Eustachian tube is 4 mm. Schwalbe adds the practical consideration that a considerable quantity of fluid can aggregate in the tympanic cavity before the level is reached by which it might be evacuated through natural channels. The sagittal diameter of the tympanic cavity, measured from the lower portion of the entrance of the Eustachian tube to the posterior margin of the entrance of the recessus, is about 13 mm. (Bezold 11-14.75 mm.).

The anterior wall of the tympanic cavity (page 464) is formed in its upper half by the tympanic ostium of the Eustachian tube, which is 3.5 mm. high (Bezold 4.5 mm. average, maximum 6 mm., minimum 3 mm.).

According to v. Troeltsch, the distance from the umbo to the most prominent point of the promontory is 2 mm. The lower portion of the drum membrane does not reach the floor of the tympanic cavity, the distance from the same is, according to Bezold, 2.71 mm. (average).

The lower space of the cavity (Jankau l. c. p. 80) lies 7 mm. medial from the upper, the anterior margin 4.5 mm. from the posterior.

Politzer (Jankau l. c. p. 80) gives the distance of the posterior inner drum segment from the inner tympanic wall as 5-7 mm., in the anterior upper quadrant, 5-6 mm., in the lower 4-5 mm.

4. *Ossicles.* Time and space forbid lengthy quotations pertaining to the ossicles. I only mention (Jankau l. c. p. 82) that the average weight of the hammer and anvil are greater in the male than in the female, whereas the reverse holds good in regard to the stapes. I am not prepared to state whether this fact has any practical bearing on the prevalence of the consequences of oto-sclerosis in the female. In connection with this idea it is interesting to note Wittmaack's statements.

Wittmaack (The Normal and Pathologic Pneumatization of the Temporal Bone Inclusive of Its Relations to Middle Ear Suppurations, Jena 1918, p. 293) says that the especially great degrees of hardness of hearing are preponderatingly caused by stapes-fixation just as much in residues of chronic middle ear suppuration as in chronic adhesive processes, and he further states that the development of "oto-sclerosis" results independently of the pathologic pneumatization. He found it also in absolutely normally pneumatized temporal bones.

5. *Eustachian Tube.* The Eustachian tube is (Jankau l. c. p. 80) 37-38 (to 45 mm.) long, and the osseous part about 8 mm., the cartilaginous about 25-27 mm. long. The tympanic end is 5 mm. high and 3 mm. wide; the pharyngeal 7 mm. high and 5 mm. wide and the isthmus 2 mm. high and 1 mm. wide.

6. *Mastoid Antrum.* Bezold, in Schwartze's Textbook, page 32, says that the antrum is 9-15 mm. long. 6-10 mm. high, 5-8.5 mm. deep.

According to Whiting (The Modern Mastoid Operation, page 145), the antrum lies within the area of the suprameatal triangle and in 95 per cent of all mastoids is to be found at an angle of 45 degrees (or thereabouts) upward and backward from the bony meatus at a depth of from one-half (½″) to three-quarters (¾″) of an inch beneath the cortex. When not so situated it will be encountered nearer the vertical meridian and further forward, and in certain instances has been found arching over the superior wall of the bony meatus only slightly external of the epitympanic space, with which it communicates by way of the aditus.

Schwalbe, page 525, says: "A horizontal plane through the suprameatal spine is always situated above the floor of the antrum. The insertion of the auricle lies 14-16 mm. behind the suprameatal

spine." I may add, incidentally, that this fact can be quoted to advantage by those who advocate the line of incision for a mastoid operation directly behind the auricle.

Bezold (Schwartze's Textbook, page 33) says that the drilling hole which starts below the crista temporalis and close behind the outer ear canal must be directed obliquely upward and forward in order to reach the antrum. The difference in height between the two points is 6-8 mm., the depth of the canal is 12-14 mm.

Jankau mentions the length of the aditus ad antrum as 4.5 mm. and its height as 5.7 mm. at the posterior end of the short process of the anvil, and the width as 6.6 mm. under the tegmen (Bezold).

7. *Mastoid Process.* Kiesselbach (Schwalbe, page 527), carried out a large number of measurements concerning the growth of the mastoid process from the first month to the nineteenth year. At the end of the first year the height of the process had grown from 7.6 mm. to 15.5 mm., in the fifth year it had reached 20 mm., and in the eighteenth year 30 mm. Bezold (Schwalbe, p. 527) studied a hundred temporal bones of adults and found the distance from the tip of the mastoid process to a horizontal line through the suprameatal spine to be 25.2 mm. (varying from 19-31 mm.), the width of the horizontal distance from the middle of the tympano-mastoid fissure to the posterior end of the incisura mastoidea averaged 25 mm. (varying from 17-34 mm.). The mastoid process of negroes is as a rule smaller than that of Europeans, that of Mongolians larger (Schwalbe and Eysell).

The distance from the suprameatal spine to the facial canal, according to Hartmann (Jankau l. c. page 83) is 15.8 mm., to the semicircular canal 16.7 mm., to the posterior upper margin of the drum membrane 11-12 mm.

According to Holmes (Jacobson Textbook of Otology, 1898, p. 280), the distance of the upper posterior margin of the drum membrane from the suprameatal spine is, as a rule, 15 mm.

Hartmann (Die Freilegung des Kuppelraumes: The anatomical relations which must be considered in opening the mastoid process concerning the possibility to injure the facial nerve and the labyrinth, Berlin, 1890) found in fifty specimens the distance from the suprameatal spine to the facial canal, eighteen times 15 mm. and less, twice 12 mm., twice 13 mm., and the distance from the suprameatal spine to the external semicircular canal eight times 15 mm., and less, and five times 14 mm.

He found the distance from the seat of operation, 1 cm. behind the suprameatal spine, to the facial canal ten times 20 mm. and less, four times 18 mm., and the distance to the outer semicircular canal eleven times 20 mm. and less, three times 18 mm. (no average measurements can be given, because in the specimens the most lateral portion of the facial and semicircular canals were not always encountered.)

Therefore, Hartmann says, one finds that one may encounter the facial or semicircular canal in a depth of 12-14 mm. from the suprameatal spine, or in a depth of 18 mm. from the seat of operation.

I present a few instruments made according to these measurements.

A probe, in the shape of a bayonet, bent twice at a right angle, of which the end-piece is 15 mm. long, may render good service during a mastoid operation (see figure 2), while another probe bent in the form of a hook, of which the middle portion is 15 mm. long,

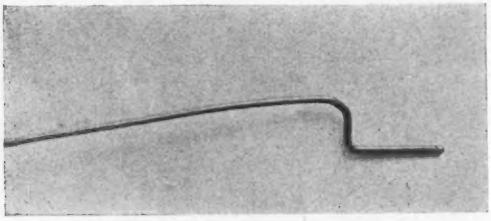


Fig. 2.

may also be useful (see figure 3). The No. 5 Reiner gouge chisel marked 15 mm. from the end may be welcome at times.

8. *Lateral Sinus.* The location of the lateral sinus, as is well known, varies considerably. The distance from the suprameatal spine to the nearest portion of the sinus may be practically negligible (see specimen, E. Amberg: The Relative Frequency of a Protruding Lateral Sinus; N. Y. Med. Jour. and Phil. Med. Jour., Sept. 9, 1905). In seventeen other specimens, picked at random, I found it varying from 6 mm. to 21 mm. (Some Practical Remarks on the Anatomy of the Temporal Bone, with demonstrations, The Physician and Surgeon, Nov., 1899.) Hartmann (Third International Otol. Congress, Basel, 1885, pp. 4 and 5) found the shortest distance between the sigmoid fossa and the posterior wall of the meatus in cross-cuts perpendicular to the axis of the meatus among one hun-

dred temporal bones to be: forty-one times 1 cm. and less, once 5 mm., five times 6 mm., six times 7 mm. The average distance was 11.5 mm., the greatest 19 mm.

Schœnemann (Basel, 1906)—Georg & Co., Temporal Bone and Base of Cranium (Jankau l. c. 1909, page 86) says: In pronounced flat-roofed pyramids which are not rotated backwards, the distance of the sinus from the posterior wall of the meatus is very great,

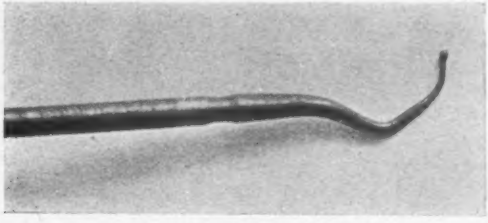


Fig. 3.

maximally 1.6 cm., in pronounced sharp angle-roofed pyramids very small, minimally 0.7 cm. If the auricle stands pretty well upright, we need not fear a protruding sinus.

E. Amberg, Journal of Ophthalmology and Otolaryngology, July, 1917, says: "The distance of the antrum mastoideum from the

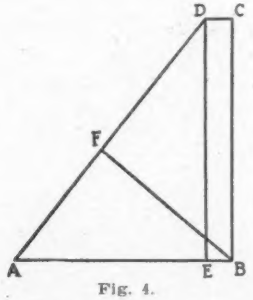


Fig. 4.

meatus is, after Bezold, 2 mm. or less. Schwartze says that the mastoid has to be opened, as a rule, 5 to 10 mm. behind the spina suprameatum, and that the width of the outer opening might be 12 mm. After these measurements I made a diagram in the following way: (Figure 4) I constructed a trapezium with a right angle, one side of which, B C, represents the distance from the supra-meatal

spine to the level of the posterior upper margin of the drum membrane, 15 mm. (after Holmes), the top of which, D C, represents the distance from the posterior wall of the meatus to the antrum, one and five-tenths mm. (after Bezold, 2 mm. and less), and the base of which represents the distance of the anterior border of the

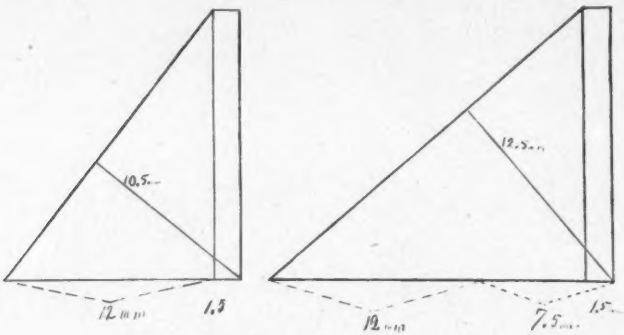


Fig. 5.

opening E from the anterior border of the posterior wall of the meatus B, for which distance, E B, I allowed one and five-tenths mm., which allowance can certainly not be considered as too liberal. For the second part of the base, E A, I allowed twelve mm., the largest diameter, according to Schwartze. If we connect A and

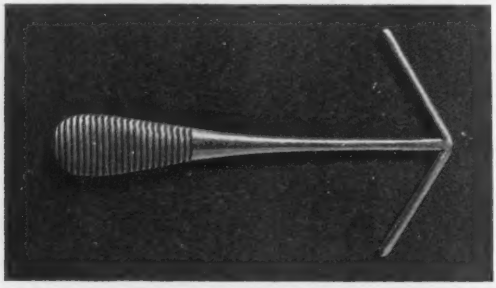


Fig. 6.

D and draw the perpendicular from B on A D, we find that this perpendicular, B F, has the length of about ten and a half mm. I do not think we go much out of the way when we regard a lateral sinus displaced forward if it approaches the supra-meatal spine more than ten and a half mm."

If we allow for B E *seven and one-half mm.*, F B is about twelve and one-half mm. (Figure 5) and if we allow for E A ten mm., F B is about twelve mm. The latter distance corresponds to that of Held.

In this connection I may add that the finding of the lateral sinus has been made easier for me by applying the method described by me in the Journal of the American Medical Association of May 19, 1906. I called attention to the fact that in adults an easily accessible portion of the lateral sinus may be found when we open that part of the mastoid process which is located in the direction of the line

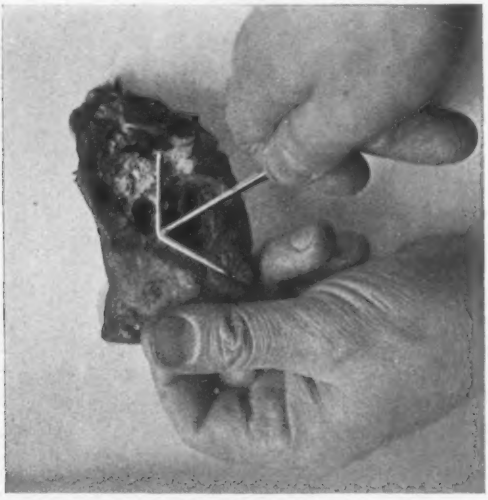


Fig. 7.

which divides into two halves the angle formed by the temporal line and the anterior border of the mastoid process (an angle of about 115° in adults). In the Medical Record, October 22, 1910, I published a guide for the lateral sinus line for adults. (See figure 6).

One shank should be held over the anterior border of the mastoid process, the other over the temporal line. (See figures 7, 8.) The handle of the guide gives the direction of the lateral sinus line. Even if the angle formed by the anterior border of the mastoid process and the temporal line should be somewhat different, the instrument is of service by allowing the same margin of deviation to both shanks. The length of the whole instrument is about 8.25 cm.

9. *Labyrinth.* Jankau gives the contents of the labyrinth as 210 cubic millimeters, 3/5 of which belong to the cochlea.

Schwalbe (l. c.) says the length of the semicircular canals varies a great deal, that the posterior lower is always the longest, 18 mm. (average) (15-22 mm. Sappey), then follows the anterior (superior) with 15 mm. (12-20 mm.), the external is the shortest, 12 mm. The proportions of the lengths are 6—5—4. The ampullae are 2.5-3 mm. long and included in the measurements mentioned before. The size of the cross-cut of the semicircular canals, which is elliptic, is 1.2—1.7 mm. to 0.8-1 mm.

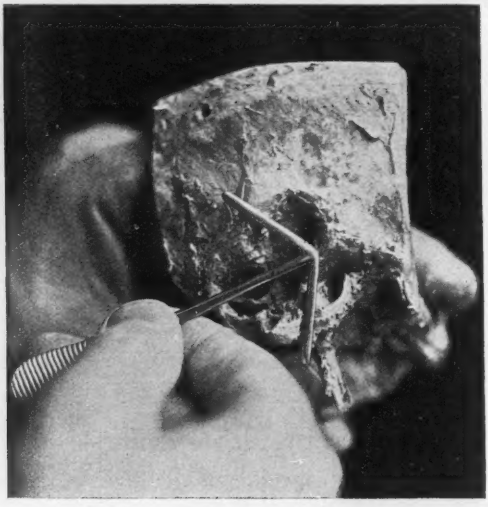


Fig. 8.

The cochlea (Schwalbe, l. c.) is about 10 mm. at its base, the distance from the base to the tip is 5 mm., the length of the canal of the osseous cochlea is about 33-34 mm., of which about 20 mm. belong to the vestibular portion and the first turn, 10 to the second, and 3-4 to the third half turn. The number of Corti's cells is 20,400 according to Waldeyer, and 16,000 according to Hensen (Jankau l. c. p. 85).

The chords of the basilar membrane increase in length toward the tip of cochlea from 1/20 to ½ mm. (Boeninghaus, Textbook of Otology, 1908, p. 61.)

10. *Meatus Acusticus Interuus.* The length of the anterior wall of the inner meatus is 13—14 mm., the length of the posterior wall is only 6—7 mm. (Schwalbe, p. 301).

Conclusion. Dry as the quotations of so many numbers and measurements may be, they may throw some light on the subject-matter from an angle not frequently considered. In practice, in consultation and while teaching, it may be necessary to use some of these measurements. We must always bear in mind that energy, once spent, is no longer available. Any consideration or procedure which enables us to conserve energy should be welcome as an aid to protect us against unnecessary fatigue. As a spectator, when an aurist endeavored to find the way to the lateral sinus in a mastoid operation, I could make it easier for him to succeed by a simple suggestion. (The lateral sinus line). Another aurist of experience, during a somewhat unusual mastoid operation, was embarrassed while he was trying to find the antrum. I was able to give him the well-known direction, which probably did not occur to him at that moment, namely, to follow a line parallel to the meatus on the upper posterior wall of the same. (Politzer.)

Only yesterday Dr. Reik told us of a surgeon who spent an hour to find the antrum.

It is, of course, impossible to make a mastoid operation fool-proof, if I may be permitted to use this expression. Nevertheless, any help which we may extend toward the more easy performance of any operation must be welcome, if only for the reason as stated before, that hereby a certain amount of energy is saved which can be utilized otherwise. Considerations of this nature are interesting and important subjects from a psycho-physical standpoint. (E. Amberg, Some Psychological Factors in Medical Work, American Medicine, Vol. 8, p. 302-305.)

Dr. Amberg showed some paracentesis knives which he had ordered made of stellite. He prefers them to the ordinary knives.

STUDIES ON THE LYMPH DRAINAGE OF THE ACCESSORY NASAL SINUSES.

DR. WILLIAM V. MULLIN AND DR. CHARLES T. RYDER,
Colorado Springs, Colorado.

In 1916 we began an investigation to determine the course of lymphatic absorption from the antrum and frontal sinus, and, incidentally, from neighboring tissues—the nasal fossae, the palate, the gums, the meninges, and the subcutaneous tissues of the face. Our first series of experiments was completed in 1918, and reported to the American Laryngological, Rhinological and Otological Society.* This was followed by a second series, which has been completed, so that we are now ready to report on the research as a whole.

We have been able to find but little reported work dealing with the lymphatics of the accessory sinuses. According to Da Costa's edition of Gray's Anatomy, which follows the more special work of Sir Frederick Treves and of Delamare, Poirier, and Cunéo, the accessory sinuses drain into the retropharyngeal lymph nodes, which receive tributaries also from the nasal fossae, naso-pharynx, and Eustachian tube, and perhaps from the cavity of the tympanum. They in turn send vessels to the internal jugular group of upper deep cervical nodes, which communicate freely with each other and with the external group, and terminate in the jugular trunk, which on the right side helps to form the right lymphatic duct or empties directly into the junction of the internal jugular and subclavian veins, and on the left side empties directly into the venous junction or into the thoracic duct.

Of the literature available in support of this description, the work of André is the most considerable:

He injected the lymphatics of the antrum in two child cadavers, of 5 and 8 years, and demonstrated many lymph vessels converging to the antral orifice, passing out, and joining the lymphatics of the middle meatus, upper surface of the inferior turbinate, and lower surface of the middle turbinate. Others passed out through the thin "posterior fontanelle" in the internal wall of the antrum to join

*For a full review of the literature bearing on this subject, as well as protocols of all the experimental animals of the first series, and a more extensive collection of photographs, see Mullin, The Lymph Drainage of the Accessory Nasal Sinuses, Trans. American Laryngological, Rhinological and Otological Society, 1919.

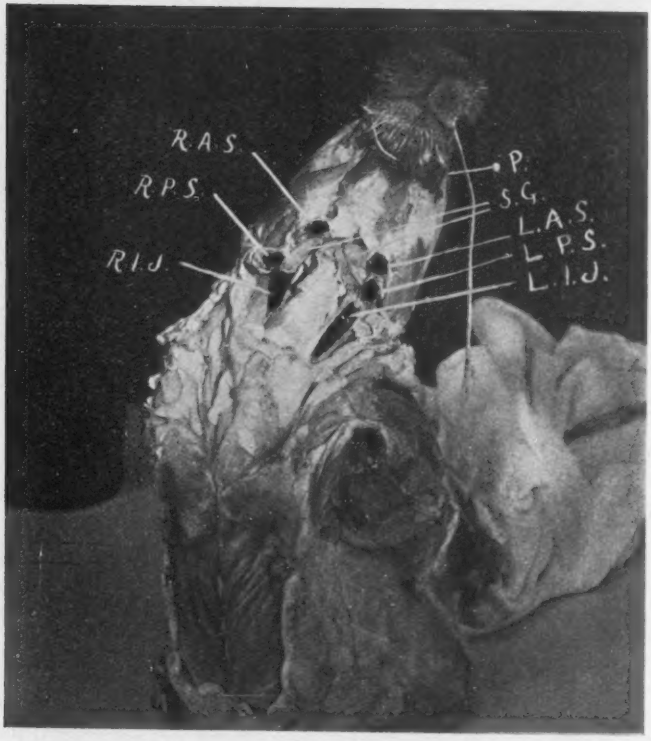


Fig. 1.

Front view of head and thorax of rabbit.
R. A. S. Rt. anterior submaxillary node. L. A. S.—Left ditto.
R. P. S. Rt. posterior submaxillary node. L. P. S.—Left ditto.
R. I. J. Rt. internal jugular node. L. I. J.—Left ditto
S. G. Submaxillary salivary glands.
P. Pin inserted in the puncture made when injecting the left antrum.
Note.—This picture is semidiagrammatic, the nodes having been darkened in the print. Wherever this has been done, it will be indicated in a foot-note.

those of the middle meatus. Of those passing out through the foramen he writes, "We succeeded in following them in the middle meatus, where they consisted of four to six large collectors, with frequent anastomoses, and having an antero-posterior direction. We saw them continue thus as far as the crease which separates the posterior end of the inferior turbinate from the anterior projection of the Eustachian tube. It is probable then, that in joining the lymphatics of the nasal fossae, they end, like these, by emptying into the pharyngeal nodes and the jugular chain."

Following André, Grünwald injected the antrum of a 60-year-old man, and virtually proved the anatomical lymphatic continuity "of the whole lymph-vascular system of the accessory sinuses between themselves and with the nose, directly in the level of the mucosa and continuously in its course, not through walls." The injection fluid entering the antral mucosa in the region of the hiatus semilunaris, extended to most of the mucosa of the middle meatus and inferior and middle turbinates, also to the ethmoid cells, sphenoidal sinus, and posterior wall of the frontal sinus; passing backward to the pharynx it ended at the projection of the Eustachian tube. No communication was established with the orbit or the gums.

Though demonstrating the anatomical connection, Grünwald deprecates the drawing of clinical conclusions from a single experiment performed under artificial conditions of pressure, upon a dead subject.

J. B. Thomas in a recent article reports seven cases of tuberculosis of the frontal sinus. In one the disease involved the frontal and sphenoidal sinuses, and the autopsy showed tuberculosis of the cervical nodes, also the right apex and bronchial nodes. Another case was complicated by mastoid disease and "glands," location not given. H. A. Lothrop reports eighteen cases of suppuration of the frontal sinus, one of which had also double antrum disease and enlarged cervical lymph nodes. It is significant that among the complications mentioned in these two reports, retropharyngeal abscess does not occur.

G. B. New has lately reported metastasis of malignant tumors of the antrum to the submaxillary, parotid, and cervical nodes.

As already suggested, all the experimental work we have been able to find on the lymphatics of the accessory sinuses, and most of that on the associated regions of the nose and throat, rests upon the method of injections on the cadaver, and therefore, as recognized by the investigators themselves, is not a sure criterion of function in the living subject.

Of the few experiments on living animals which have any relation to our subject, we may mention the work of Cornet on absorption of tubercle bacilli from the nasal mucus membrane of guinea pigs, that of Goodale and Henderson on absorption of inert powdered substances from the surface of the tonsils in guinea pigs, and Grober's injections of the tonsils in rabbits and dogs. Very recently Noyes and Dewey, using dogs, have demonstrated the lymph drainage from the teeth to the submaxillary nodes.

F. R. Sabin has approached the subject of lymphatic anatomy from the embryological point of view, by injections of pig embryos, and her findings go far to explain the disagreements among different investigators as to the lymphatic connections between the various regions of the head, neck and thorax. Such connections exist developmentally, and in all probability idiosyncrasies of individual adult lymphatic anatomy, as well as varying conditions of pressure or infection, may in some cases serve to bridge over from one part of the jugular field to another, in other cases fail to do so. Therefore, when one chooses a limited portion of the field for study, as we have done with the accessory sinuses, one should not expect to find an absolutely distinct and narrowly limited course of absorption therefrom. For a fundamental characteristic of lymph drainage is that it is widely regional and rich in anastomoses.

We have investigated the lymph drainage of the antrum and frontal sinus, and associated regions, by means of a series of experiments on living animals. The work has consisted chiefly of injections and inoculations of the antrum in rabbits and the frontal sinus in cats. The anatomy was worked out on the animals of the series, and also on other normal animals. The antrum in the rabbit and the frontal sinus in the cat are both fairly large as compared with the whole skull, and the anatomical relations are quite similar to those in man. As a rule, direct communication between the sinuses and the nasal fossae is somewhat freer than in the human subject.

The lymph nodes are much less numerous than in man, and their arrangement more constant, but the regional distribution corresponds closely. The upper end of the long internal jugular node corresponds to the retropharyngeal nodes in man, this long node being the analogue of the whole deep cervical chain.

ANTRUM.

The study of the antrum was undertaken first, and began with a series of injections with India ink. This fluid—a suspension of finely divided carbon—was chosen because the pigment granules are

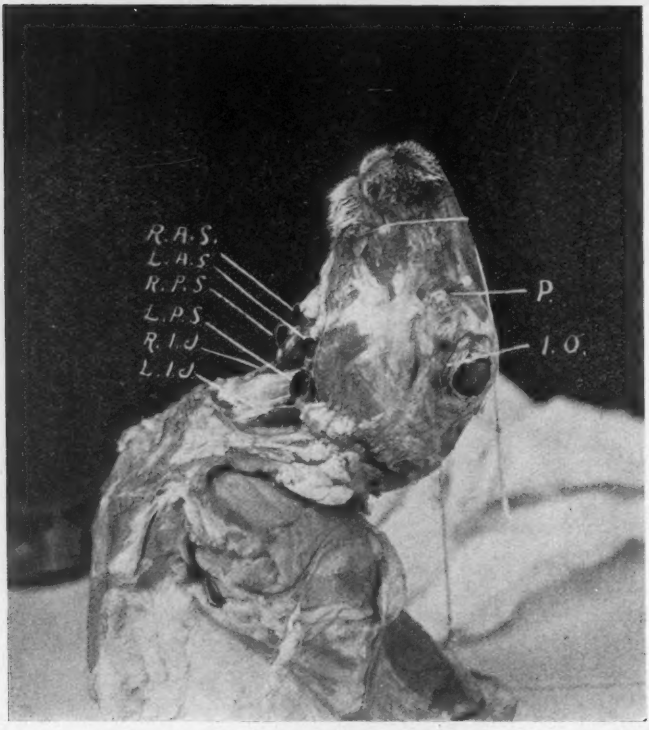


Fig. 2.

Left side of head and thorax of rabbit.
R. A. S. Rt. anterior submaxillary node.
L. A. S. Left posterior submaxillary node.
R. P. S. Rt. posterior submaxillary node.
L. P. S. Left posterior submaxillary node.
R. I. J. Rt. internal jugular node.
L. I. J. Left internal jugular node.
P. Pin in puncture made when injecting left antrum. Some ink discoloration around it.
I. O. Ink in tissues or orbit, extending to edge of conjunctiva.
Note.—Semidiagrammatic as regards nodes. L. I. J., however, has not been retouched.

about the size of cocci, and are absolutely insoluble; it is therefore practically the same in physical characteristics as a dense emulsion of bacteria. The technique consisted simply in entering the antrum with a hypodermic needle, under ether anesthesia, by penetrating the skin of the face and the thin external wall of the superior max illary bone. The fluid was then injected and the needle quickly withdrawn. If the point of the needle was free in the cavity of the antrum, some of the ink nearly always escaped into the nose and ran out at the nostril. However, we found that ink was quite readily carried away from the nasal fossae by secretion, without being absorbed, while it stagnated in the antrum and was in part taken up by the lymphatics.

After several days the animals were killed with chloroform and autopsied, and in many cases the diagnosis of pigmentation—or, in the inoculated cases, of infection—of nodes and other tissues was confirmed by microscopic sections.

The first rabbit injection (Rabbit 1) gave the most striking result. In this case the point of the needle, after passing through the left antrum, penetrated the mucosa of the inner wall, and about 1 cc. of ink was injected beneath the mucosa against strong resistance, resulting in marked exophthalmos of the left eye. The left nasal fossa was then probed with an applicator. No ink escaped into the nose.

The rabbit was chloroformed after two days. Autopsy showed considerable pigmentation of the subcutaneous tissue over the left antrum, very deep pigmentation of the mucosa of the left antrum, purulent exudate and marked pigmentation of the mucosa of the left nasal fossa in the region adjacent to the antrum, with fainter extension upward almost to the roof of the superior meatus, laterally to the left ethmoidal cells and across the median line to the middle and lower part of the right nasal fossa, and even to the lining membrane of the right antrum, backward on both sides to the posterior wall of the naso-pharynx, where microscopic sections showed it in large masses within lymph vessels in the diffuse lymphoid tissue of the region, backward on a higher level into the sphenoidal sinus, and forward on both sides almost to the nostrils. No discoloration was detected in the bone or cartilage of the nasal septum, the extension to the right side apparently being around the posterior edge of the septum. Thus the distribution of the injected substance in the nasal fossae and accessory sinuses corresponds quite closely with that observed by Grünwald in the human subject, and illustrates again the complete continuity of the lining membrane.

There was very marked pigmentation of the whole of the left orbit, extending as far as the conjunctiva but not into it, and of the tissue surrounding the sockets of the left molar teeth, but no extension to the oral cavity, the tonsils, or the larynx. There was some pigmentation of the meninges around the optic chiasm and left olfactory nerve.

So far the findings are open to the same criticism which applies to injections on the cadaver, namely that the injection was made under pressure and may have broken through where there is no normal functional communication. Beyond the field of direct extension this criticism is not so valid. There was very deep pigmentation of the submaxillary and internal jugular lymph nodes on both sides, without any discoverable pigmentation of the other tissues of the neck, thoracic wall, or pleura. The left supparotid node was strongly pigmented. The lungs showed numerous small round spots, almost black, especially noticeable on section, and the blood in the heart appeared abnormally dark. Microscopic sections showed carbon in the blood, endothelium, and tissue spaces of both sides of the heart, perhaps slightly more marked in the right side, much carbon in the branches of the pulmonary arteries in the lungs, both free and dotted through the vessel walls, less in the other vessels of the lungs, a good deal in more or less dense focal masses within the lymphatics of the lung tissue, and very small amounts in a bronchial node. There was slight pigmentation of a retrosternal node.

Microscopic sections of the various affected nodes showed carbon granules free in the lymph sinuses, sometimes in considerable masses, and in smaller quantity and finer division within blood vessels and endothelial cells.

The course of absorption here is perfectly clear, from the general left nasal field to the cervical lymph nodes of both sides, the lymph ducts, the great veins, the right heart, and the lungs, whence a residuum filtered through to the left heart and the general circulation. However, owing to the massive injection and the size of the field reached by direct extension, the experiment is not sufficiently limited either in the source of absorption or the degree of effect upon the different cervical lymph nodes. It was therefore necessary to follow it by a series of experiments with the injection more strictly confined to the antrum itself, or to other limited regions.

The reports of the most interesting members of this series follow:

PROTOCOLS—ANTRUM.

Rabbit 2. About ½ cc. ink in left antrum. Some escape from nose.

Autopsy, four days. Much ink in left antrum, considerable amount in overlying tissues. Traces lying free on mucosa of nasal fossae, and mixed with pus in right antrum (proved by microscope). Very little absorption. Very slight pigmentation of left anterior and posterior submaxillary nodes. None elsewhere.

Rabbit 3. Two cc. ink in right antrum. Much escape from nose, 1.5 cc. ink in subcutaneous tissue of left side of face, and submucosa of left side of palate.

Autopsy, three days. Small amount of ink in right antrum and overlying tissues. None in nasal fossae. Large amount in subcutaneous and muscular tissues of left side of face and submucosa of left side of palate. Moderate discoloration of left anterior submaxillary node, very slight of posterior. Deep discoloration of left internal jugular node. Pharynx, larynx, thorax and cranial cavity negative.

Microscopic sections. Tonsils and postauricular nodes, normal. Left posterior submaxillary node, small amount of carbon.

Rabbit 8. About ½ cc. ink in right antrum. Some escape from nose.

Autopsy, one day. Moderate amount of ink in right antrum. Very slight discoloration of right anterior and posterior, and left anterior, submaxillary nodes. Slight discoloration of right internal jugular node. Verified by microscopic sections.

Rabbit 9. A few drops of emulsion of 11-weeks-old culture of human tubercle bacilli in right antrum. Lining mucosa of antrum scratched with needle.

Autopsy, thirty-seven days. In mucosa of right antrum several small yellowish plaques, which in microscopic section showed tuberculosis at a fairly advanced stage of caseation, and loaded with tubercle bacilli. Right anterior and posterior submaxillary nodes, moderately advanced tuberculosis. Right internal jugular node, early tuberculosis with moderate number of bacilli. Left posterior submaxillary node, moderately advanced tuberculosis; left anterior, apparently normal, no bacilli found. Left internal jugular, early tuberculosis. At upper margin of lower lobe of left lung, near the root and immediately beneath the pleura, a whitish rounded elevated mass about 5 mm. in diameter, which in microscopic section proved to be a tuberculous focus in a fairly early stage of caseation, with numerous bacilli. The bronchial nodes on microscopic section showed very early tuberculosis with beginning caseation and numerous bacilli. The meninges appeared somewhat congested, and microscopic sections of meninges and brain showed some

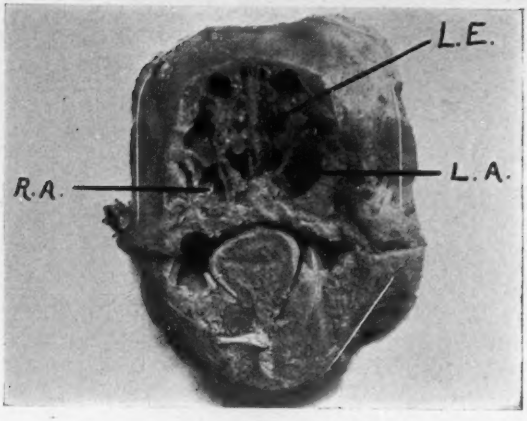


Fig. 3.

Transverse section of head through antra of rabbit.
Transverse section of head through antra of rabbit.
R. A. Rt. antrum, normal (approximately).
L. A. Left antrum, containing ink.
L. E. Left ethmoid cells, containing ink.

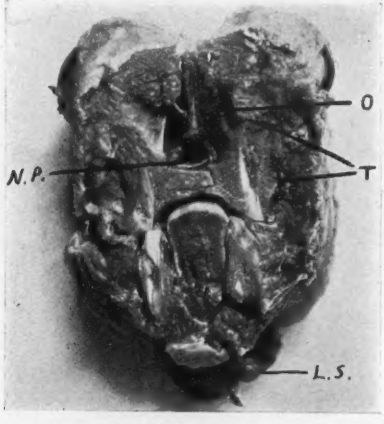


Fig. 4.

Transverse section of head through nasopharynx and anterior part of orbits of rabbit.
N. P. Nasopharynx, somewhat pigmented.
O. Areolar tissue of left orbit, containing ink.
T. Tissue surrounding sockets of left molar teeth containing ink.
L. S. A left submaxillary node.

lymphocyte infiltration around the vessels, but no bacilli were found in several sections examined, and no perfectly characteristic tubercles.

Rabbit 11. About ½ cc. fresh pus from antrum of Case P. in right antrum. This patient (Case P.) had a chronic suppuration of the left antrum, and bronchiectasis. Smears of the pus from the antrum showed pneumococci, staphylococci, and a variety of bacilli both Gram-positive and Gram-negative; twenty-four-hour broth culture chiefly pneumos and staphs.

Died, eleven days. Autopsy. Marked inflammation of right antrum, slight of nasal fossae. Slight congestion of submaxillary and internal jugular nodes. Intense hemorrhagic inflammation of trachea and bronchi. Pneumonia of left lung in stage of red hepatization, of right lung in stage of resolution. Moderate nephritis. Spleen small and pale. Smears: Right antrum, pneumos and staphs. Right internal jugular node, pneumos and staphs. Left lung many capsulated pneumos, free and in phogocytes. Trachea same. Right lung same, but less numerous. Heart blood, very rare pneumos, numerous staphs.

DRAINAGE OF THE ANTRUM AND ITS RELATION TO THE LUNG.

In the first series, the lymph drainage of the antrum by way of the cervical lymph vessels and nodes was demonstrated, and the possibility of substances absorbed from the antrum reaching the lung by an exclusively lymph- and blood-vascular route proved. In view of the clinical observation that chronic antrum disease and chronic pulmonary—especially bronchial—disease so often occur together, we were anxious to follow up this line. The former experiments proved that the antrum *can* act as a source of absorption; may therefore, if diseased, be, like tonsils and tooth roots, the ambush of a focal infection which, taken up by the lymphatic division of the circulatory system, can be carried to any other vulnerable tissue—in this case especially the lung. Is this in reality the way in which the chronic antrum-chronic bronchitis cases develop?

We inoculated four more rabbits in the antrum by the method previously described. Two rabbits (RV and RVIII) were given plain emulsion of tubercle bacilli, while two others (RVI and RVII) were given tubercle bacilli plus India ink, in order to compare the development of lesions with absorption pure and simple. No attempt was made to close the foramen from the antrum into the nose. The inoculating fluid was allowed to escape in the natural way of an unobstructed suppurating antrum.

RV was killed after three months, and showed two minute ulcers in the mucosa of the outer wall of the right (injected) antrum. No tubercle bacilli were found in scrapings, and an attempt to remove the membrane for sections was not successful, as it adhered closely. The right submaxillary nodes showed early tuberculosis. The remaining tissues examined in gross and microscopically (jugular nodes, lungs, mesenteric nodes, spleen) were negative.

RVIII, killed at two months, showed a caseous lesion of the left (injected) antrum. The right submaxillary nodes were negative. The left submaxillary and jugular nodes showed early tuberculosis. The lungs showed a number of small conglomerate tuberculous nodules with early caseation. The bronchial nodes showed very early tuberculosis. The spleen, liver and mesenteric nodes showed no tuberculosis.

RVI, killed at two months, showed slight carbon discoloration and well advanced tuberculous lesion of the right antrum. The right submaxillary nodes contained a moderate amount of carbon, and a few small early tubercles. The left submaxillary nodes were negative. The right and left jugular nodes showed traces of carbon, and some extremely early (not unquestionable) tubercles. The lungs contained a small amount of carbon, and numerous good-sized conglomerate tuberculous nodules with caseation. The bronchial nodes showed a moderate amount of carbon, and some very early tubercles. The abdominal viscera were negative.

RVII, killed at three months, showed a small amount of carbon in and over the right antrum, with caseous and nodular tuberculosis of the antral mucosa. The submaxillary and jugular nodes, lungs, and bronchial nodes, showed small amounts of carbon, but no tuberculosis. The spleen and mesenteric nodes were negative.

These findings show once more, both in the carbon discoloration and the development of early tubercles secondary to the primary focus in the antrum region, the immediate course of absorption from the antrum via the cervical nodes. But they also show a relation between the stage of development of the antrum and lung condition on the one hand, the cervical and bronchial node condition on the other hand, which is quite different from that observed in the first series. In the first series, in two separate cases, one of carbon, the other of tuberculosis, we had a conspicuous primary focus in the antrum, a less conspicuous condition in the cervical nodes, still less in the lungs, with the bronchial nodes following. In this series, especially in RVI, also in RVIII, we have not even approximately this relationship. The lesions of cervical, as of

Fig. 5.

Front view of head and neck of cat.
R. A. S. Rt. ant. submaxillary node.
L. A. S. Left ant. submaxillary node.
R. P. S. Rt. post. submaxillary node.
L. P. S. Left post. submaxillary node.
R. I. J. Rt. internal jugular node.
L. I. J. Left internal jugular node.
Note.—Semidiagrammatic as regards pigment in nodes.

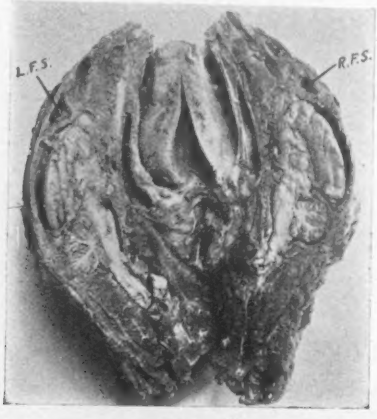


Fig. 6.

Sagittal section of head of cat.
L. F. S. Left frontal sinus, with septum in place, opened to show interior. No ink.
R. F. S. Rt. frontal sinus, full of ink.

bronchial nodes, are extremely slight, obviously secondary to antrum and lungs respectively. The lung lesions, on the other hand, seem as long standing as the antrum lesions.

Of course we are not dealing with a simple situation here. The presence of carbon without tuberculous lesions in the cervical nodes adjacent to well-developed tuberculosis of the antrum, in RVII, shows how the matter is complicated by phenomena of resistance. However, the most reasonable interpretation seems to be this: that while in the first series we had a lung condition metastatic from the antrum, and therefore slower in development, in RVI and RVIII on the other hand we have a lung condition as fully developed as that of the antrum, simultaneous with it in origin, probably by inhalation of some of the emulsion draining out into the nose at the time of inoculation. Relative amounts of carbon in the lungs and bronchial nodes as compared with the cervical nodes do not help us much, as the situation is obscured by the fact that slight degrees of anthracosis occur normally in the lungs and bronchial nodes, and by the more or less active removal of carbon from the lungs by endothelial leucocytes, which must alter the picture to some extent when the rabbits are allowed to live two or three months.

In order to simplify the conditions and secure more emphatic results, if possible, a series of rabbits were injected in the nasal fossae by way of the anterior nares with India ink (Rs X, XI, XII, XVII) and with emulsion of tubercle bacilli (Rs XIV, XV). The results, more fully reported in another article, showed in a most striking way the readiness with which substances present in the nose and pharynx in a fluid form are inhaled by these animals —apparently as a sort of spray caused by their rapid breathing —and the extensive discoloration or lesion of the lungs which can be produced by fairly small amounts (0.5-1.0 cc.) of ink or bacillary emulsion. The findings gave strong support to the inference that the lung lesions in RVI and RVIII had been produced in this way, by inhalation of bacilli overflowing into the nasal fossa in the inoculating fluid.

It seems then, that the co-existence of lesions of the same bacteriological type in antrum and bronchi, may be explained either by assuming (1) a primary antrum disease with metastasis to the lungs through the lymph and blood circulation, as in the case of other septic foci, (2) a primary antrum disease with extension to the bronchial tree by inhalation of discharge, or (3) a simultaneous development of antral and bronchial disease from a primary acute process, a particularly severe and tenacious generalized pneumo-

coccus or streptococcus infection of the respiratory mucus membrane perhaps becoming chronic in these two locations. There is also the possibility of a reflex connection through the central nervous system, but our experiments have given no light on that question.

FRONTAL SINUS.

The study of the frontal sinus has been made on cats, using essentially the same methods employed in the study of the antrum. The technique is more difficult. The naso-frontal duct is very open, and injected fluids immediately run out into the nose, so that there may be no absorption at all. We tried to overcome this in the first series by injecting iodin or trichloracetic acid before the India ink, to produce inflammatory closure, but this was not entirely successful. In the second series we got better results by injecting a few drops of hot melted wax, which fills the duct and hardens in it. It is hard also to prevent a little ink from running back around the needle in the hole drilled in the frontal bone, as this must be large enough to allow the escape of air during injection, after the naso-frontal duct is closed. This stains the subcutaneous tissue of the scalp, from which it is absorbed.

That feature of the lymph drainage of the frontal sinus which has the greatest practical interest and importance, is the communication which exists between the sinus and the dura, through lymphatics in the posterior wall of the sinus. These are the channels through which infection extends, probably in reverse of the normal direction and depending on pressure changes due to obstruction of the naso-frontal duct, when bone necrosis and brain abscess develop as complications of frontal sinusitis.

First Series. Cat 9, which may be selected as on the whole the best of the series, was given a few drops of iodin in the left frontal sinus, followed by about ½ cc. of ink. There was very little escape of the fluids by way of the nose, practically none into the scalp around the needle.

The cat was chloroformed after four days. Autopsy showed a very small amount of ink in the subcutaneous and periosteal tissues over the left frontal sinus, a moderate amount in the sinus itself, along the naso-frontal duct, in the left ethmoidal cells and the left nasal fossa. There was a small amount in the right nasal fossa, chiefly on the surface of the middle turbinate. There was slight infiltration of the posterior bony wall of the left frontal sinus. In Cat 5, this infiltration occurred to a much more marked degree,

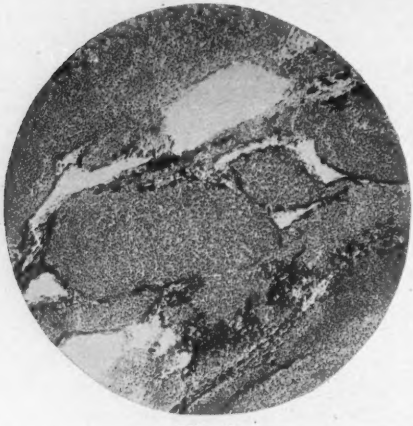


Fig. 7.

Posterior wall of pharynx of rabbit. (x 90). The black areas are masses of carbon granules in the lymph sinuses, the rest of the field is normal lymphoid tissue.

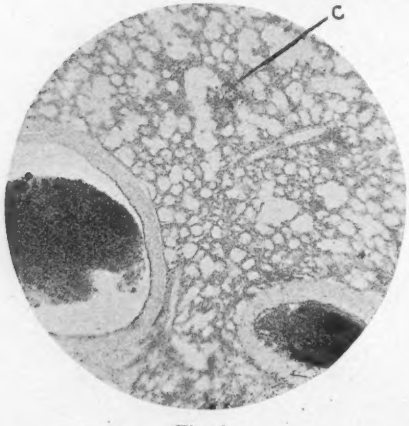


Fig. 8.

Left lower lobe of lung of rabbit (x 40). Showing two pulmonary artery branches containing carbon masses and granules, with finely divided carbon in their walls. Also accumulations of carbon in the lymphatics of the lung tissue proper, as at C.

penetrating the bony wall at many points and entering the subjacent dura, but not the pia or brain.

To return to Cat 9, there was very slight discoloration of all the submaxillary nodes, and traces of discoloration in the subparotids and postauriculars. None was found in the internal jugulars, either in the gross or in microscopic sections. They were slightly affected in Cats 5 and 7, but in both cases there was a possibility of ink reaching them from the scalp, as in Cat B, which was injected subcutaneously in the right brow. It is quite certain, however, that they form the next relay after the submaxillaries—as well as receiving some drainage independently—and that a massive injection, or infection, which reaches the submaxillaries, is pretty sure to pass on to the internal jugulars.

Cat 2. About 1 cc. ink in cranial cavity through puncture at upper edge of left frontal sinus.

About 1 cc. ink in right frontal sinus. Posterior wall punctured.

Autopsy, two days: Considerable ink in subcutaneous and periosteal tissues over right frontal sinus. Small spot over left. Small amount in right frontal sinus and nasal fossa. None in left frontal sinus. Much in anterior part of dura and in pia of entire brain, extending forward around optic and olfactory nerves, and back around the spinal cord, everywhere more marked on right than left. Slight discoloration left anterior and posterior submaxillary nodes, moderate of right posterior submaxillary. Marked discoloration right internal jugular nodes, moderate of left. Very slight of right supparotid. Very slight of bronchial nodes (probably normal anthracosis).

Microscopic sections: Brain, much carbon in meninges, small amount in sheaths of vessels which enter cortex of brain, numerous scattered granules in substance of cortex, with much rarer ones in the medullary substance. They can nearly always be seen to lie close to an endothelial (?) nucleus, and probably still correspond to the distribution of the vessels, so that the findings do not contradict the accepted belief that brain tissue proper has no lymphatics. Right subparotid node, small amount of carbon.

Cat 3. One cc. ink in left frontal sinus. Some escape from nose.

Autopsy, three days: Small spot of discoloration in tissues over left frontal sinus. Small amount in mucosa of left frontal sinus. No discoloration of lymph nodes or any other tissue found.

Cat 4. A few drops iodin in right frontal sinus, followed by about 1 cc. ink, a good deal of which flowed back around the needle. No escape from nose.

Autopsy, two days: Purulent exudate in right nasal fossa, seropurulent exudate in incision over right frontal sinus, with a good deal of ink in subcutis and periosteum, extending slightly to left of median line. Much ink in right frontal sinus, visible through posterior wall from cranial cavity. None in naso-frontal duct or nasal fossa. Slight discoloration right anterior submaxillary node, trace in right posterior submaxillary. Very slight discoloration left anterior and posterior submaxillaries. Moderate of right subparotid, slight of left subparotid. Traces in right and left postauriculars (confirmed by microscopic sections). None found in internal jugulars.

Second Series. Cat 1. Both frontal sinuses injected with melted wax, followed by India ink. Killed and autopsied after three days. Moderate discoloration of the scalp over both sinuses. Left naso-frontal duct well stopped, considerable ink in sinus. Right not entirely stopped, ink in sinus, also right nasal fossa and pharynx. Some discoloration of posterior bony wall of both sinuses, not however, penetrating to the dura. Slight discoloration of submaxillary nodes on both sides, trace in left subparotid, moderate discoloration of both postauriculars.

Cat 2. Right frontal sinus injected with melted wax, followed by India ink. Killed and autopsied after four days. Some discoloration of scalp over sinus. Right naso-frontal duct well stopped, clean injection of sinus. Marked discoloration of posterior wall and of underlying dura. None of pia. Slight discoloration of right submaxillary, postauricular, and subparotid nodes, marked discoloration of upper end of right jugular node. Slight discoloration of left subparotid, very slight trace in left postauricular, none of left submaxillary and jugular.

Cat 2 gives the best demostration yet secured of the communication between the sinus and the cranial cavity, and the two experiments give some support to the previous conclusion that lymph drainage from the frontal sinus also is by the cervical vessels and nodes. But of this we cannot be absolutely certain until we find a way to eliminate all leakage into the scalp.

ABSORPTION FROM THE NASAL FOSSAE.

In order to test the truth of an inference drawn from our first series, that there is little or no absorption from the uninjured nasal mucous membrane, we performed the following experiments:

RX was given about 1 cc. of India ink in the nose by way of the nostril. The injection was made with a pipette introduced just far enough to get the ink into the nose. This was done twelve

times over a period of three weeks and a half. The rabbit sometimes took the ink without any signs of reflex irritation, sometimes sneezed or coughed once or twice during the injection, but not afterwards. When killed after the twelfth injection, he showed no discoloration of the cervical nodes whatever, but intense blackening of the lungs and bronchial nodes.*

RXI, RXII and RXVII, given a smaller number of injections in the same way, gave the same negative results as regards absorption from the upper air passages.

RXIV and RXV were given an emulsion of tubercle bacilli in the same way. When killed after seven weeks, they showed no lesions of the cervical nodes, but advanced lesions of lungs and bronchial nodes.

These findings differ from those of Cornet, who brushed tubercle bacilli on the supposedly intact nasal mucous membrane of guinea pigs and subsequently found the cervical nodes involved; and of Goodale, who reported absorption of inert pigment substances from the surface of the tonsils. It is unwise to be dogmatic in any branch of so dark and intricate a subject as biology, as many investigators—including Koch—have proved by their mistakes, and our negative results do not entitle us to say that absorption of bacteria and inert substances from the uninjured upper respiratory mucous membrane cannot occur. They do raise the old question, so often asked in the case of absorption from the intestinal mucosa, How can one prove the absence of injury? If absorption does occur, it seems very strange that we do not find spontaneous carbon pigmentation (anthracosis) of the cervical nodes, even in animals—especially cats—whose lungs and bronchial nodes are markedly anthracotic, and whose upper respiratory tract is constantly loaded with finely divided carbon.

THE RELATION OF LYMPH DRAINAGE OF THE PHARYNX TO THE TONSIL.

We were struck in the first series by the absence of any discoloration of the tonsil in animals in which nearby tissues were heavily injected, and drew the inference that the tonsil perhaps has no field of absorption beyond its own extensive surface.

In RI and RII we injected India ink into the pharyngeal mucosa adjacent to the tonsils. Autopsy showed deep discoloration of the tissues of the pharyngeal wall, but none whatever of the tonsils. The lymph vessels from the pharyngeal vault to the angle of the

*As noted above, the visceral findings in these rabbits are more fully reported in another paper.

jaw were deeply discolored, and it is probable that a lymphangitis of these vessels figures in the pain and tenderness around the angle of the jaw in acute tonsillar and pharyngeal infections.

In these rabbits, as in the first series, we were impressed by the ease with which minute particles such as these of carbon, entering the venous circulation from the lymph ducts, can pass through the pulmonary into the arterial circulation. In RII the walls of the pulmonary artery and ascending aorta showed a fine black tracery. On microscopic section this proved to consist of small vessels packed with carbon, and this was particularly marked in the aorta.

CONCLUSIONS.

1. Lymphatic absorption from the antrum, whether of bacteria or of inert substances, is by the way of the submaxillary and internal jugular nodes, which latter include the analogue of the retropharyngeals in man, to the lymph ducts, the great veins, the right heart and the lungs. Substances reaching the lungs may of course pass on to the left heart and the general circulation, and may also be taken up by the pumonary lymphatics and reach the bronchial nodes.

2. Absorption from the tissues of the face in the antrum region, and from the palate, is by the same route.

3. The subparotid and retrosternal nodes may sometimes be reached by absorption from the antrum and neighboring tissues.

4. Absorption from the frontal sinus seems to follow the same course as absorption from the antrum. From the scalp over the sinus absorption usually reaches the subparotid and postauricular nodes as well.

5. Absorption from the meninges reaches the internal jugular and probably also the submaxillary nodes.

6. There is little if any absorption from the uninjured mucosa of the nasal fossae.

7. Lymphatic drainage is widely regional. Anastomosis from node to node and from side to side is free, so that it is not always possible to fix on a single node or group of nodes as the certain point of election for metastasis from a given region.

8. In respect of lymphatic function, as well as anatomically, the lining membrane of the nasal fossae and accessory sinuses is a continuous whole, and infection at one point can probably be conveyed by lymphatics to practically any other point.

9. There are lymphatics penetrating the posterior bony wall of the frontal sinus, and these may carry substances from the sinus to the dura over the frontal lobe of the brain under exceptional conditions of pressure in the sinus.

10. The tonsils do not appear to receive drainage from any area beyond their own surface, with its crypts.

11. Drainage of the sinuses into the upper air passages renders the bronchi and lungs liable to infection by inhalation, and this factor may be as important as lymphatic metastasis in accounting for the clinical association of sinus disease with broncho-pulmonary disease, though in non-draining sinus cases it seems to be excluded.

We have not found any direct lymphatic communication from the plexuses and nodes of the head and neck to the lungs and pleura. Theoretically, on the basis of development, connections may exist, and may even occasionally function. But this seems a far-fetched explanation of lung metastases from nose, sinus, and throat infections. The obvious, easily demonstrated, and insufficiently emphasized routes are: (1) lymphatic, down the deep cervical chain and by the ducts and veins to the right heart, thence directly to any or all parts of the lungs; (2) bronchial, by inhalation of infectious material escaping into the nose.

Throughout the investigation, and especially in the experiments on the frontal sinus where an incision is made, the possibility of aspiration of the injected substances by injured veins is not excluded. However, the findings considered as a whole, and in view of the extremely slight injury done to vessels by the technique used in the antrum series, make it almost certain that venous aspiration has been a negligible factor.

We must of course recognize that this research only enables us to draw conclusions in the case of the animals used, the rabbit and cat. But we have been struck repeatedly by close parallels between our experimental findings on the one hand, and clinical and anatomical observations on the other, and we are convinced that further study will establish further parallels, and that most, if not all, of our conclusions can be proved to apply to the human subject.

Note. The writers are indebted to Doctors Gerald B. Webb and G. Burton Gilbert of Colorado Springs, through whose laboratory it was possible to carry on this research, and to Doctor James C. Todd of the State University of Colorado at Boulder, who so kindly made the microscopic photographs.

BIBLIOGRAPHY.

M. Andre: Contribution à l'étude des lymphatiques du nez et des fosses nasales. Thèse de Paris, 1905.—Recherches sur les lymphatiques du nez et des fosses nasales. Annales des maladies de l'oreille et du larynx, XXXI, pp. 425-442.

BALLENGER: Diseases of the Nose, Throat and Ear. Lea and Febiger, Philadelphia, 1909.

CORNET: Demonstration von tuberkulösen Drüsenschwellungen nach Impfungen von Tuberkelbacillen bei Meerschweinchen. Chirurg. Cong. 1889, 138.

CROWE, WATKINS AND ROTHHOLZ: Relation of Tonsillar and Naso-pharyngeal Infections to General Systemic Disorders. Bulletin of the Johns Hopkins Hospital, XXVIII, 311, pp. 1-63, 1917.

DELAMORE, POIRIER, AND CUNEO: The Lymphatics. Leaf's English Edition.

DOWD: The Surgical Treatment of Tubercular Cervical Lymph Nodes. A. Surg., XLII, pp. 49-74. 1905.

GOODALE: Absorption von Fremdkörper durch die Gaumentosillen. Arch. f. Laryng., VII, 90.

GRAY: Anatomy. DaCosta's Edition, Philadelphia, 1905.

GROBER: Die Tonsillen als Eintrittspforten für Krankheitserreger, besonders für den Tuberkelbacillus. Klinisches Jahrbuch, XIV, pp. 547-634. Jena, 1905.

GRUNWALD: Die Lymphgefässe der Nebenhöhlen der Nase. Archiv. für Laryngol. und Rhinol., XXXIII, pp. 1-4. Berlin, 1910.

HARTZ: The Lymphatics of the Nose and Nasopharynx with Consideration of the General Lymphatic System. THE LARYNGOSCOPE, St. Louis, Mar. 1912.

KUTTNER: Ueber die Lymphgefässe der aüsseren Nase und die zugehörigen Wangenlymphdrüsen in irher Beziehung zur Verbreitung des Nasenkrebses. Beiträge zur klinischen Chirurg., XXV, pp. 33-39. 1899.

LOTHROP: Frontal Sinus Suppuration with Results of New Operative Procedure. Section on Laryngol., Otol., and Rhinol., A. M. A., 1915.

MOST: Ueber den Lymphgefässapparat von Nase und Rachen. Archiv. für Anat. und Entwickelungsgesch. Leipsig, 1901, pp. 75-93.

MULLIN: The Lymph Drainage of the Accessory Nasal Sinuses. Trans. Am. Laryng., Rhin., and Otol. Soc., 1919.

MULLIN and RYDER: Experimental Lesions of the Lungs Produced by the Inhalation of Fluids from the Nose and Throat. Am. Rev. Tuberc. IV, 9, pp. 683-687, 1920.

NEW: The Treatment of Malignant Tumors of the Antrum. *Jour. A. M. A.*, v. 74, pp. 1296-1300, May 8, 1920.

NOYES AND DEWEY: The Lymphatics of the Dental Region. *Jour. A. M. A.*, v. 71, pp. 1179-1184, Oct. 12, 1918.

F. R. SABIN: The origin and Development of the Lymphatic System. The Johns Hopkins Hospital Reports, Monographs, New Series, No. 5. Baltimore, 1913.

THOMAS: Tuberculosis of the Frontal Sinus. Section on Laryngol., Otol., and Rhinol., A. M. A., 1915.

WOOD: The Lymphatic Drainage of the Faucial Tonsils. Am. Jour. Med. Sci., CXXX, pp. 216-227. 1905.

REPORT OF FOUR CASES OF RADICAL FRONTAL SINUS OPERATION WITH UNUSUAL PATHOLOGICAL FINDINGS.*

DR. FIELDING O. LEWIS, Philadelphia.

Case 1. R. P., single, white, male, aged 25. Occupation, farmer. Italian by birth. Referred and admitted to the Jefferson Hospital, Philadelphia, November 12, 1919.

Chief Complaint. Severe frontal headaches and bilateral nasal discharge.

Family History. Negative.

Personal History. Has used alcohol and tobacco moderately. Denies venereal infection. For the past two years, following an acute illness, has had recurrent attacks of severe pain in the frontal region, and bilateral purulent discharge from the nose. About one year ago his condition was diagnosed in a neighboring city as a frontal sinus infection, for which an external operation was performed without relief. Three other such operations have been performed since that time, without results.

Examination. There was an external fistula over the right eye, which by means of a probe was found to lead into the frontal sinus, and through which there was constantly a discharge of pus. Both nasal cavities were filled with polypi and mucopurulent discharge. Transillumination showed a darkened area over both frontal and maxillary regions. X-ray examination reported fluid in all of the nasal accessory sinuses except the sphenoidal. Blood Wassermann examination negative.

General Physical Examination showed other organs apparently normal.

Operation. November 18, 1919. Under intra-tracheal anesthesia an incision through the skin and underlying tissues was made through both eyebrows and extending across the bridge of the nose at a point lower down, such as described for the Beck operation for osteo-plastic resection of the frontal sinuses. The skin and subcutaneous tissues were dissected up to the hair margin.

Pathological Findings. By means of a probe introduced into the cavity made by the removal of bone in the previous operations, both

*Paper read at the Twenty-sixth Annual Meeting of the American Laryngological, Rhinological and Otological Society, held at Boston, Mass., June, 1920.

frontal sinuses were found extremely large, extending laterally to the malar bones and upward almost to the hair line. The septa between the sinuses was removed or destroyed by disease. The anterior plate was necrotic. The naso-frontal duct was small, thereby causing inadequate drainage. After removing the greater part of the anterior plate of the frontal region of the skull, both sinuses were found to be divided by numerous septa, and all the compartments filled with polypi, granulations and pus. The roof of the right orbit was also necrotic, and the orbit itself contained pus, which was constantly draining through the external fistula. After removing all diseased bone, diseased mucous membrane and granulations, the naso-frontal ducts were enlarged by means of a frontal

Case 1.

sinus rasp. The nasal polypi and anterior ethmoidal cells had been removed previously under local anesthesia. Two cigarette drains were placed laterally on either side, and rubber tube drainage established through the naso-frontal ducts, and the incision closed by interrupted sutures.

Complications and Results. Three days following the operation, the patient developed symptoms of infection of the right eye. In consultation with the ophthalmologist, Dr. Howard F. Hansell, the eyeball was found to be involved and becoming rapidly destroyed by the infection. Operation for its removal was found necessary. The patient was discharged on the eleventh day following the frontal sinus operation, with no evidence of infection excepting some discharge from the original external fistula. This continued until both maxillary sinuses were operated on by the Denker method, and following which there has been a complete recovery, and when last

seen (in April) there was no evidence of any pus in either nostril, and the external fistula was completely closed.

Case 2. W. R., married, white, male, aged 51. Native of Boston. Occupation, mariner. Was referred and admitted to the Jefferson Hospital December 3, 1919.

Chief Complaint. Pain over left eye.

Family History. Negative.

Personal History. Usual diseases of childhood. No history of other illnesses.

Present Illness. Twenty-nine years ago, patient was struck in forehead over left eye, with piece of timber, fracturing skull over left eye. Patient was unconscious three weeks. Following recovery

Case 2.

from the injury, he states that his health was good for two years. At that time he blew a piece of bone from the left nostril, which seemed to have detached itself from the left frontal region. He had no further evidence of nasal disorder, until about ten years ago, when he began to suffer with neuralgic pains and swelling over the left eye. This, he states, appeared during attacks of acute cold in the head, and for the past two years he has complained of dizziness and frontal headaches which have been almost constant.

In August, 1919, the patient was operated on in another city, by the external route, and was told that the cavity was curetted. This, however, did not relieve his suffering.

Examination. There was an external fistula over the left eye which extended into the frontal sinus. Both nostrils were free and no pus or polypi visible. Transillumination showed a darkened area over the region of both frontal sinuses. Maxillary sinuses clear. X-ray showed large frontal sinuses apparently filled with fluid.

Blood Wassermann negative. Physical examination also negative.

Operation. December 4, 1919. The same procedure as above described was followed.

Pathological Findings. The frontal sinuses were unusually large, extending laterally as in the previous case, to the malar bones. The anterior plate of the frontal sinuses was found to be partially necrotic. This was removed, exposing the sinuses, which were found to be filled with pus, and the septa between the sinuses destroyed. The posterior plate on the left side was necrotic for an area the size of a twenty-five-cent piece, with the exposure of the dura to that extent, but well walled off by adhesions between the dura and the skull. All diseased bone and tissue was removed and enlarge-

Case 3.

ment of the naso-frontal ducts made with the nasal rasp. Drainage was placed and the wound dressed in the usual manner.

The patient made an uninterrupted recovery and was discharged on the sixteenth day following the operation, with complete cessation of symptoms, and when last seen (one month following the operation) there was no evidence of any further infection.

Case 3. Dr. J. R. C., married, white, male, aged 33. Dentist by profession. Native of Virginia. Was referred to me by Dr. J. C. Jones, of Newport News, Va., and admitted to Jefferson Hospital, Philadelphia, December 8, 1919.

Chief Complaint. Severe frontal headaches, with bilateral nasal discharge.

Family History. Negative.

Personal History. Usual diseases of childhood. Otherwise, negative.

Present Illness. The patient had an attack of influenza about eight years ago. This was followed by frequent headaches and a purulent discharge from the right nostril. The discharge became more profuse and foul smelling. Headaches more frequent. A laryngologist was consulted, and the right frontal sinus was found to be involved. An intra-nasal operation was performed to facilitate drainage, resulting in some improvement, which, however, was not of long duration. Some months later the right frontal sinus was opened externally, followed by a period of improvement. The same symptoms again appeared, more distressing. He then consulted another laryngologist, who found it necessary to perform a more radical operation on the same sinus. The desired results not having been obtained, he was again operated on about two years later, for infection of both frontal sinuses, with similar results. His headaches were so intense and the discharge from both nostrils so offensive that he found it necessary to discontinue the practice of dentistry. The doctor in charge thinking it probably was of luetic origin, regardless of a negative Wassermann, gave the patient a thorough anti-luetic treatment, with no improvement.

Examination. Externally, there was a marked deformity over the right frontal region, caused by the removal of necrotic bone at the previous operations. There was a discharging fistula leading to the left frontal sinus, and a large cavity on the right, extending to the malar bone. There was pus in both nostrils. The middle turbinals had been previously removed, and the naso-frontal ducts were patulous. The maxillary sinuses were clear on transillumination, and X-ray reported the maxillary sinuses clear. Wassermann negative.

Operation. December 9, 1919. Same as in Case No. 1.

Pathological Findings. Frontal sinuses were extremely large, extending above to the hair line and laterally to the malar bones. The upper boundaries of the sinuses were divided by septa into an innumerable number of cavities, all of which contained pus and granulations. Failure to remove these in the previous operations, I believe, was the cause of his continued trouble. The posterior plate in the median line was very soft and as much of this removed as seemed advisable.

Results. The wound required daily attention for several weeks, which consisted in thorough cleansing with a weak iodin solution, drying, and a 2 per cent solution of dichloramid T was applied. When seen a few days ago there was no evidence of infection, and the wound was completely closed. There still remains a marked

external deformity, which I hope to correct by a plastic operation at a later date. He has resumed the practice of dentistry.

Case 4. O. C., married, male, colored, aged 24. Native of Philadelphia. Occupation, postman. Was referred and admitted to the Jefferson Hospital, Philadelphia, December 23, 1919.

Chief Complaint. Swelling over the left frontal region, and headaches.

Family History. Negative.

Personal History. The usual diseases of childhood. Otherwise, health had been unusually good.

Present Illness. Dull frontal headaches began eight years ago. Continued intermittently for three years. Intra-nasal operation was performed by a surgeon in Virginia, from which he received tem-

Case 4.

porary relief. One year later was operated on in Washington, D. C., by the intra-nasal route. This was followed a few weeks later by an external operation performed by the same surgeon; the left maxillary sinus being also operated on at the same time. The condition improved and caused no further discomfort until two weeks before admission to the Jefferson Hospital, at which time the patient complained of a severe frontal headache and slight nasal discharge. Headache persisted for five days and suddenly ceased. The following day a swelling suddenly appeared over the left frontal sinus. This was accompanied by drenching night sweats for three days.

Examination. Externally, over the left frontal region, there was a marked fluctuating swelling. Transillumination showed the right side clear and other sinuses apparently normal, confirmed by X-ray

studies. Both nostrils were free from pus. No constitutional symptoms were present, and general physical examinations showed the other organs apparently normal.

Operation. December 24, 1919. Under intra-tracheal anesthesia the usual Killian technique was followed.

Pathological Findings. The left frontal sinus was filled with an opaque fluid which was found to be sterile. An accessory sinus was found in the median line, communicating with the diseased side. There was little necrosis of bone.

Results and Complications. On the third day following the operation the patient's temperature suddenly jumped to 104°, reaching 105-4/5° on the second day. This was preceded by a chill. Blood culture negative. Spinal fluid report was "No increase in pressure of flow. Clear fluid." Normal cell count. Fehlings reduced. Globulin slightly increased. No pus cells. Temperature continued high for several days, and in consultation with Dr. Thomas McCrae, there were physical signs of double lobar pneumonia, and the patient was transferred to the Medical Department for further treatment. Was discharged one month following his admission to the hospital, and when last seen there was no evidence of any frontal sinus condition, and the patient had regained his normal weight.

SUMMARY.

1. It seemed rather unusual to the writer for four such interesting cases to present themselves within the space of six weeks, all of which had had from two to five previous operations on the frontal sinuses.

2. I wish to take this opportunity to fully endorse intra-tracheal anesthesia as a valuable adjunct in the operation on the accessory sinuses.

3. I believe these cases demonstrate the futility of intra-nasal operations on the frontal sinuses in chronic infections of long duration. And

4. Importance of removing every vestige of diseased mucous membrane in these cases.

A SIMPLE, BLOODLESS AND PAINLESS OPERATION FOR THE COMPLETE EXENTERATION OF THE ETHMOID LABYRINTH.

DR. HAROLD HAYS, New York City.

Any number of operative procedures have been devised for the removal of the ethmoid cells and gaining entrance into the sphenoid. Most of these operations are more or less difficult: first, because one must master a certain technic with specialized instruments; secondly, because in the majority of instances the amount of bleeding obscures the field of operation; and thirdly, it is almost impossible to cocainize the parts sufficiently to eliminate pain.

It is for these reasons that I am suggesting the following operation, which I have performed over a hundred times, and for which I claimed no originality until I had described it to a number of men, many of whom have requested that I place it before the profession. It may happen that any number of operators are doing

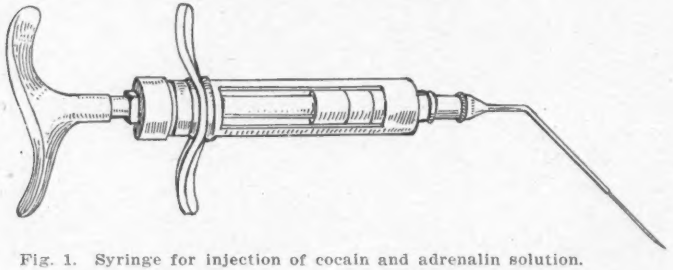


Fig. 1. Syringe for injection of cocain and adrenalin solution.

their ethmoid operations in the same way. In fact, I have seen Dr. Gustav Tieck of New York do a similar operation. However, I believe that this is the first time that its description has been presented to the rhinological profession.

Never having been able to perform a satisfactory operation on the ethmoid labyrinth, either by the Ballenger method or the Mosher method or any of the other methods described, chiefly because the instruments were not applicable to every case and because of the profuse hemorrhage, I finally worked out the simple operation which I am about to describe, which is both painless and bloodless.

The patient is placed on the flat operating table with the head

slightly raised on one or two pillows. An application of a fresh 10 per cent cocain solution, preferably from a dropper bottle, is made to the mucosa of both sides of the nose (if both sides are to be operated upon). Such application must desensitize the mucosa of the septum, the middle turbinate, particularly its lateral sides and the posterior choana. When one feels sure that the superficial mucosa is desensitized, an application of a 1-1000 adrenalin solution is made. One is now ready for the infiltration anesthesia, on which, more than anything, depends the success of the operation. I use a strong, glass and nickle, 5 cc. syringe, with a long, heavy-shanked needle attached. (Fig. 1.) A solution is made up as follows: 5 grains of crystal cocain are placed in 3½ drams of sterile water to which

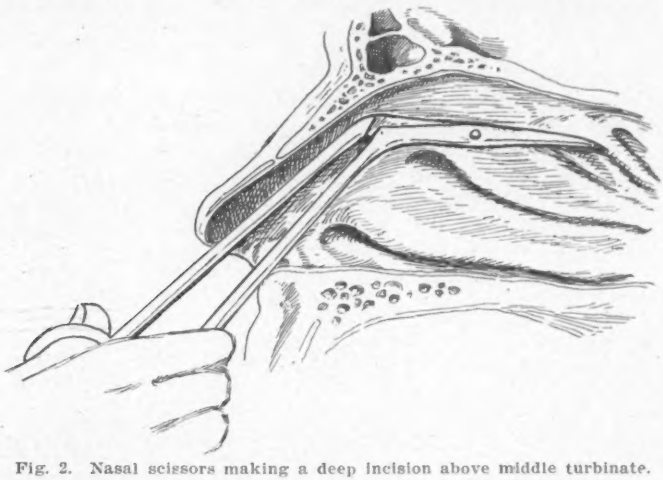


Fig. 2. Nasal scissors making a deep incision above middle turbinate.

is added 1-1000 adrenalin solution up to 4 drams. The syringe is filled. Injections are now made directly into the ethmoid cells. The needle is *forced through the mucosa and bone* in various parts of the middle turbinate and ethmoid cells, from before backward until one is sure that he has infiltrated as far back as the sphenoid. One may have to use from 5 to 10 cc. of this solution. After the injection, one should wait five to six minutes. If both sides of the nose are to be operated upon, the first will be ready for operation as soon as one has finished infiltrating the second side.

A deep incision is made above the middle turbinate with a sharp nasal scissors. (Fig. 2.) This incision should be made as high up in the nose as possible. One now takes a small, sharp, thin chisel

(Fig. 3) and places it in this incision. (Fig. 4.) I have been in the habit of using the small, straight-edged Freer sub-mucous chisel. The chisel is forced straight back through the ethmoid cells, care being taken that the blade is held parallel with the floor of the nose and that it does not deviate from the imaginary line of the sphenoid. (Fig. 5.) In many cases the chisel blade can be forced through the cells without a great deal of effort, but at times a slight tap of the mallet on the chisel may be necessary. After the chisel has progressed until the bony resistance of the sphenoid wall is encountered,

Fig. 3. Freer septum chisel for penetrating the ethmoid cells.

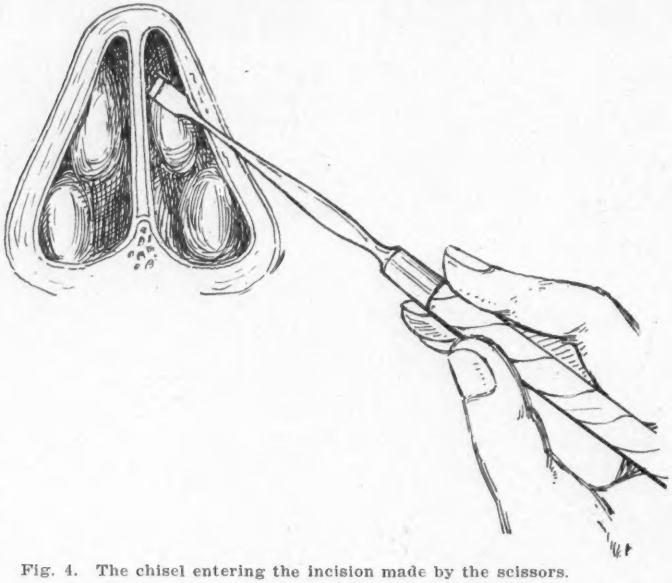


Fig. 4. The chisel entering the incision made by the scissors.

one depresses the mass downward into the nasal cavity. At times one may have to use the chisel in the same manner at the outer portions of the labyrinth (Fig. 6) in order to free it entirely. We are now ready for the removal of the labyrinth *in toto*. This can be done in many ways, but I prefer to surround the mass with a suitable snare (Wright pistol snare), seeing that the shank of the snare is forced into the deep incision made by the chisel as far as pos-

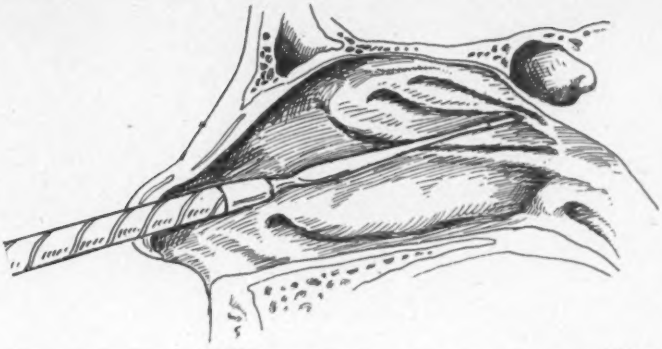


Fig. 5. The chisel through the ethmoid cells almost to the opening in the sphenoid. (The illustration is not quite correct. The chisel should be above the middle turbinate and proceed directly backward toward the sphenoid.)

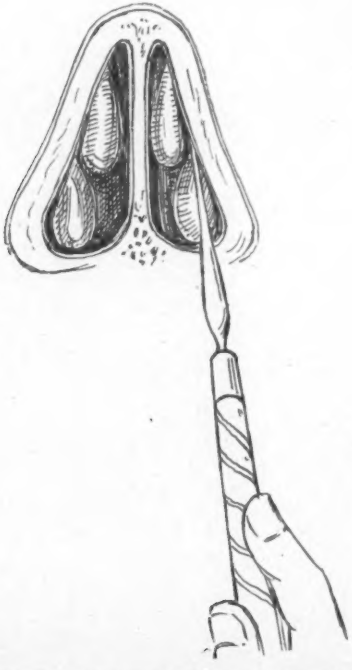


Fig. 6. The chisel along the outer side of the ethmoid labyrinth.

sible. The mass thus freed is frequently so large that it is impossible to remove it from the nostril without an *accouchement forcé*.

The operated part, being free from blood, one is able to obtain an excellent view. The upper cells, no doubt, have not been removed, but one can see the opening into the sphenoid in most cases. A sharp, biting forceps (Grunwald) will remove the upper cells. Such a procedure should be followed by a curettement of the upper cells with any suitable curette. The sphenoid cavity should be thoroughly explored with a probe. The first bleeding and pain may occur with the curettement, as one is now beyond the infiltrated field.

After the operation the patient is placed in bed in a sitting position after being given a hypodermic of a quarter grain of morphin. An ice cap is placed on the head and small ice compresses over the bridge of the nose. No packing is placed in the nose. Small pledgets of cotton, which should be frequently changed, are placed in the nasal orifices. The patient leaves the hospital at the end of twenty-four hours. Suitable mild cleansing, alkaline solutions should be sprayed in the nose gently every day until the parts look clean. This after-treatment is most important, as small fringes of tissue may remain which can be painlessly removed at any treatment.

I have performed this operation over one hundred times in the past few years. In no instance has there been any complication and seldom did the patient complain of any pain. In fact, in the majority of cases, the patients have been amazed that so severe an operation can be performed without any discomfort.

2178 Broadway.

OPERATIVE PROCEDURE IN CHRONIC PERSISTENT OBSTRUCTION IN THE LACHRYMAL SAC.

Dr. F. H. Brandt, Boise, Idaho.

Dacryocystitis, with or without complete stenosis in the nasal outlet of the lachrymal sac, has received a great deal of attention in the hands of ophthalmologists. Up to a few years ago very little was attempted to correct this troublesome condition outside of probing, dilatation and irrigation of the lachrymal apparatus. The average results obtained did not warrant continuation of this very dis-

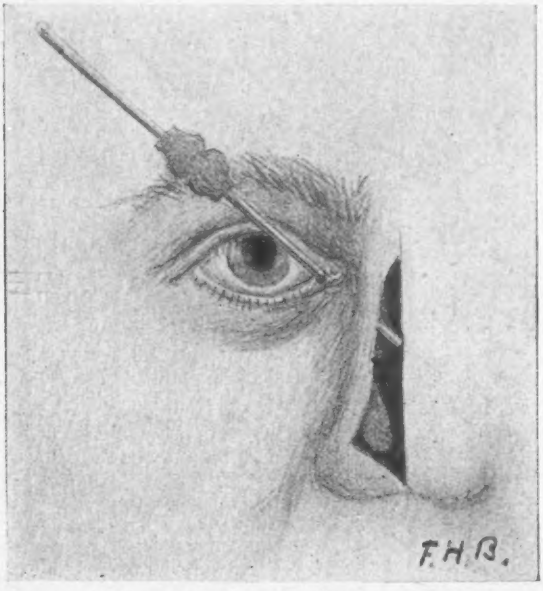


Fig. 1. Lachrymal Probe through Canaliculus into nose.

agreeable procedure. In late years, a very nice little operation of removing the entire sac, or destroying the same by the use of trichloric-acetic acid, according to the method of Gifford, has received considerable attention, with relatively good results. The tear gland soon accommodates itself to the new environment, and under ordinary conditions the troublesome watering of the eye ceases.

Whether the lessened amount of watering of the eye has any influence of favoring infection of the cornea, might come under consideration.

As long ago as 1910, West published a report of an operation by means of which he was able to effect an opening in the nasal duct without resecting any part of the middle turbinate. A couple of years later he was working out the operation and gave courses in this very ingenious operation in Berlin, where I had occasion to see him do this work. Unfortunately, very little attention was paid

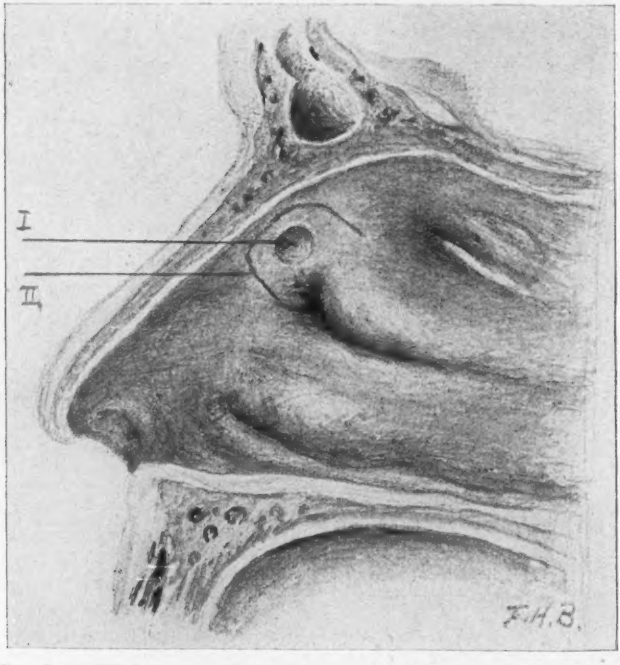


Fig. 2. I. Window resection of mucous membrane with periosteum. II. Flap around window.

to this. Men like Halle, Mosher, Beck, Yankauer and others took it up and modified the operation, but the average run of nose men are not doing the operation, hence my excuse for this report.

The purpose of this operation is to effect a permanent opening between the lower end of the lachrymal sac, at its junction with the nasal duct with the upper part of the nose just in front of the middle turbinate, the opening thus created has a direct outlet and

the opening below the lower turbinate is disregarded. Naturally this procedure has received little attention in the hands of eye men, being purely a nose operation; but not enough nose men are doing this extremely satisfactory but difficult operation, not so difficult that any good nose operator might do this with a little practice, and the results obtained will justify the effort. After having ascertained the chronicity of the tear sac condition, that is to say, palliative means having failed, we proceed in the following manner:

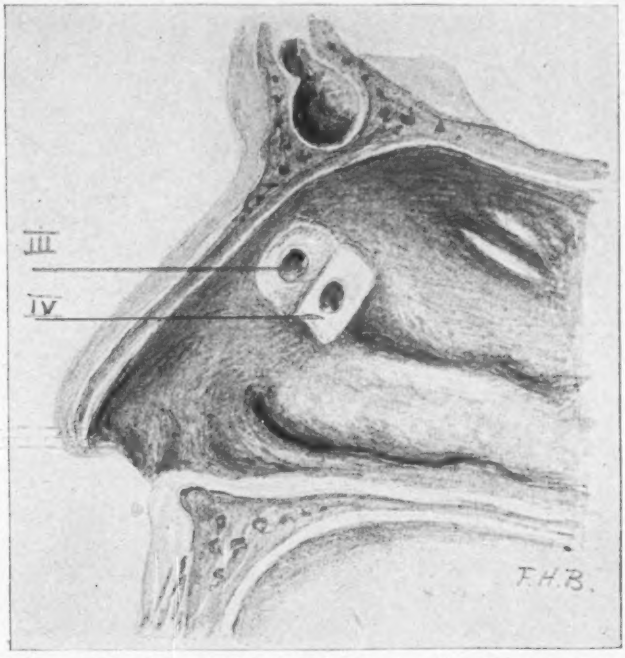


Fig. 3. III. Window chiseled through lateral wall. IV. Reflected flap.

The operation is best performed under local anesthesia. Cotton pledges of a 20 per cent solution of cocain with a little adrenalin added, are placed high up in the nose in front and above the middle turbinate, not forgetting one at the posterior end of the middle turbinate over the nerve supply. A 1 per cent solution of novacain is injected into and around the lachrymal sac from the outside; in this way complete anesthesia is effected.

The first step in the operation consists in passing a lachrymal probe through the puncta into the sac, passing it forward and at an angle of about 45° force this probe through the bony wall into

the nose, so that the probe will emerge at the lowermost part of the sac.

This gives you a good guide and you at once proceed to cut a window of mucous membrane and periosteum, the size of about 8 millimeters around this probe. You can now remove the probe and remove this little flap. This gives you a permanent landmark. The next step is making a flap. Incision is made 8 millimeters above, in front and below this window down to the bone, loosened,

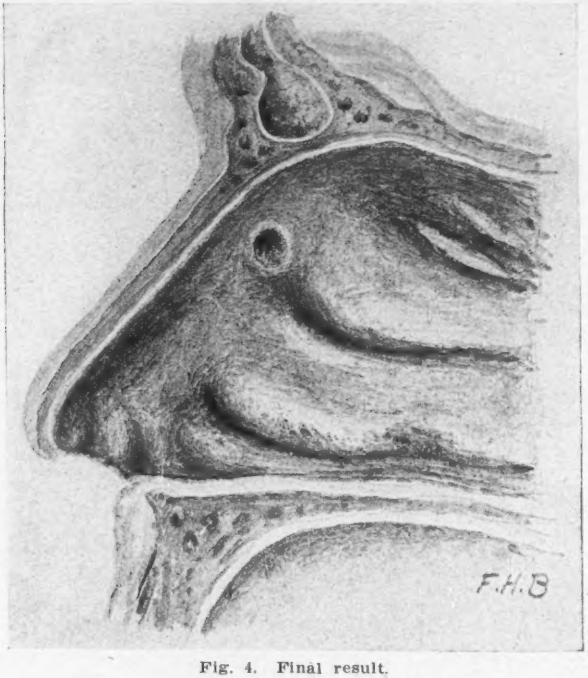


Fig. 4. Final result.

and pushed back out of the way. Now you remove enough bone, corresponding to the size of the lower part of the tear sac; this is best accomplished with a chisel, slightly curved backwards at the end, on account of the corresponding curve of the lateral nasal wall. When this is done your sac is exposed and that portion of the sac exposed to view is removed, in addition the nasal duct is cut in two at its junction with the sac. The bony edges of the window should be made as smooth as possible in order that edges of the tear sac will unite with the edges of the window in the mucous membrane. The original flap is now replaced and union takes place

between the nasal mucous membrane and that of the tear sac; a new outlet is thus created. A loose packing is placed over the flap and left for twenty-four hours. The after-treatment consists in irrigating through the canaliculus for three or four days, which takes care of the crusting in the nose. I wish to call attention to the importance of making the bony opening a little larger than the opening in the tear sac, to prevent recurring stenosis of this outlet. It is remarkable how soon purulent conditions will clear up under this procedure.

In most of our cases we found some involvement in the anterior ethmoid cells which received operative attention at the same time.

COMMUNICATION

The *Editor*, THE LARYNGOSCOPE—In the January number of the THE LARYNGOSCOPE, I note an article by Dr. John Zahorsky, entitled "Does Removal of Adenoid Vegetations prevent Acute Disease of the Middle Ear?" Permit me to answer that question in the affirmative. While the doctor does not insist on the non-removal of the adenoids, he does speak of its contraindications, without pointing them out, and leaves one to infer that many needless adenoidectomies are being done, which may be true.

Some 10 years ago, I had an occasion to discuss the question of adenoidectomy and its beneficial results, and made the remark that considering the slight amount of risk involved in its performance adenoidectomy, is the most beneficial operation known to surgery. After 10 more years of experience, I would like to repeat that statement in italics. In the same issue of this journal (page 56), Dr. Coates of Philadelphia mentions the fact, which is corroborated by practically every clinician in this country, that we are having fewer cases of ear trouble in our clinics since the majority of children are having their tonsils and adenoids removed.

In this article, Dr. Zahorsky reports some 32 cases of acute otitis media in 220 cases covering a period of 3 years, in other words, an average of about 5 cases per 100 per year, which I feel sure is a low average for non-operated cases. In the first place, the doctor wrongly assumes that the adenoid is the only source of acute middle ear infections and hence is disappointed when its removal does not prevent all cases of otitis media. He forgets the faucial tonsils, the infected sinuses, the nasal catarrhs, bronchitis and general lowered resistance from any cause. Even in a number of the cases reported, tonsils were present, as was also bronchitis.

His second premise which is erroneous is to assume that because a child has had an operation for the removal of the adenoids that an efficient operation has been done. My observation has been that adenoidectomy is more frequently poorly performed than any other operation in throat surgery. This does not necessarily apply to the general practitioner or the general surgeon, who parades in this field with impunity, but it often applies, I regret to have to state, to the operation as done by some specialists. If this obtains in clinics where men are supposed to be experienced in operating upon the nose and throat, we would scarcely expect the general practitioner to do an efficient operation hampered by an insufficient anesthesia, incompetent assistance and the want of proper light and the necessary experience.

It would seem that his cases were not thoroughly studied or inadequately reported and the indictment against adenoidectomy was not sustained; and that we *can* depend on adenoid removal as a prophylactic in acute infections of the middle ear; when the operation is *efficiently* done and when the other sources of infection are eliminated.

DR. OSCAR WILKINSON.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION ON RHINOLOGY AND LARYNGOLOGY.

October 27, 1920.

Case of Bilateral Abductor Laryngeal Paralysis. DR. LESTER MEAD HUBBY.

Mrs. G. R. Female, age 41, born in Russia. Family history negative for tuberculosis, syphilis, rheumatism, malignancy, etc. Had measles as a child with no sequellae. One ovary removed eight years ago. Has had considerable dental trouble and also chronic rhinopharyngitis. No history of syphilis. Has five healthy children and had two miscarriages. As a child she had repeated attacks of tonsillitis, and now has chronic hypertrophied tonsils. Nine days previous to admission began to have cough, pain near the larynx, dyspnea and pain in right side of chest. The evening of February 6, the ninth day of her illness, the dyspnea became alarming and she was brought to the Harlem Hospital about midnight.

Physical Examination: Markedly cyanotic, severe inspiratory and expiratory dyspnea with stridor. Heart, lungs, abdomen, extremities, etc., normal. A Board of Health physician connected with the diphtheria service, being present, inserted an intubation tube which relieved her dyspnea considerably. Throat smear showed some bacilli suggestive of diphtheria but on culture was negative.

Examination of the larynx showed considerable edema of all parts of the larynx except the epiglottis. There was bilateral abductor paralysis of the cords. The cords were in close opposition except a slight chink in the posterior commissure and were immovable.

The intubation tube was expelled and reinserted several times daily during the following seven days. Then the tube was again expelled. Neither the house physician nor I were successful in replacing it.

She was now very weak, cyanotic and near collapse, therefore a high stab tracheotomy was performed in the emergency and a tracheotomy tube inserted. The knife was dull and had to be inserted several times to cut through the cartilage of the trachea. The dyspnea gradually subsided but tissue emphysema ensued spreading in the areolar subdermal tissues all over the head, neck, body and arms.

She has never shown any tabetic symptoms: Romberg negative, pupils normal, no ataxia, knee reflexes present and normal, nor has she had symptoms of any other nervous disease involvement.

February 19 the Wassermann report came back negative.

X-ray of chest negative.

February 20 the urine examination showed marked trace of albumin, some erythrocytes and fine granular casts.

The tissue emphysema disappeared in about ten days.

She gradually improved and left the hospital March 27, 1920, still wearing the tracheatomy tube.

April 26, on removing the tube and closing the tracheal opening with a gauze sponge, she could inspire air, but no expell it.

May 10 she could breathe in and out somewhat through the larynx.

October 10, 1920, she could breathe very well through the opening opposite the arytenoids and the right cord now abducts slightly.

The etiology of this condition is obscure in her case as well as in a large proportion of cases reported. Syphilis is the most common cause. She, however, has no symptoms pointing that way and has improved without specific treatment.

Operation on the larynx was not permitted.

Laryngofissure with removal of the cords, false cords and soft parts down to the perichondrium was contemplated.

DISCUSSION.

DR. FREUDENTHAL said that the picture he saw did not seem to correspond to the characteristic image seen in bilateral abductor paralysis. You all remember the characteristic picture: The abductor cords run parallel and are almost closed. They close more at each attempt at inspiration. The picture seen in this case is entirely different. The anterior portion seems to come together and the posterior portion is wide open; both vocal cords move somewhat and dilate on inspiratin. This is not seen at all in abductor paralysis. It would seem that there is some posterior swelling which prevents the approach of the vocal cords.

Dr. Freudenthal suggested putting the patient under suspension laryngoscopy in order to discover the exact condition and remove any offending tissue.

DR. HARMON SMITH said that he fully agreed with Dr. Freudenthal that this was not a true case of abductor paralysis; that there was still some movement in the posterior third of the cord and that the anterior two-thirds were not tightly approached and that there was some slight movement there, and that the picture did not present the usual aspects of a true case of abductor paralysis. The surgeon who had first introduced an intubation tube had made a great mistake, as it had only produced trauma; and as the paralysis, if a real paralysis, never recovers, the removal of the intubation tube will leave the larynx in the same condition as before. The only justifiable surgical procedure in these cases is tracheotomy. Semon and others have reported the removal of the cords to give the patient room for respiration, but even in these cases the outcome has never been very satisfactory. In this particular case he believed that the picture presented might be already influenced by the trauma induced by the presence of the intubation tube.

In paralysis of the larynx one has to look not only at the periphery for the cause, but all along the course of the nerve back to its origin. In bilateral paralysis of the abductor type syphilis is the most frequent underlying cause but profound toxemias, as diphtheria and other infectious diseases, can produce the condition. Likewise a malignant involvement of the thyroid, taking in both recurrent laryngeal nerves: Tubercular or syphilitic glands of both sides of the neck, or aneurism of the subclavian on one and the arch of the aorta on the other, or a tumor on the floor of the fourth ventricle, from which the nerve springs, could also produce this condition. An osteoma or syphilitic infection at the base of the skull may produce a double-sided paralysis. A one-sided paralysis is very much easier of solution. Mediastinal glands, glands of the neck, thyroid, etc., together with peripheral tumors often occasion such a condition. Both one-sided and double-sided paralysis (so-called) are frequently nothing more than ankylosis of the cricoarytenoid joint. Particularly in gouty or rheumatic patients one should unquestionably exclude the possibility of ankylosis before expressing a definite opinion. In these gouty cases, however, pressure will elicit pain when exerted about the region of the cricoarytenoid articulation.

In the case under observation the etiological cause was very indefinite and could only be arrived at in his opinion by exclusion, but so far as the removal of tissue in the larynx, as suggested by Dr. Freudenthal, he wished to express the opinion that the less surgical interference within the larynx the better, and that rest induced by the presence of the tracheotomy tube was the best surgical treatment that could be instituted.

Case of Epithelioma of Nose. DR. LESTER MEAD HUBBY.

P. S., age 46, married. No family history of tuberculosis, syphilis, malignancy, rheumatism or nervous disease. Never sick.

In 1904 he picked out a blackhead from the bridge of the nose. He was troubled a great deal with these little sebaceous cysts. This particular one now became irritated and very itchy. Gradually became swollen.

In 1906 it was cut out by Dr. Kingsbury.

In 1910 this spread out toward the cheek and was curetted.

In 1914 it became crusty again. Not treated again until December, 1919, when it was again curetted.

In June, 1920, he came under the care of Dr. Howard Fox, who has treated him with X-ray four times at monthly intervals with much benefit.

The anterior end of the nose has completely disappeared so that the remnant is nearly flush with the face.

A Case of Recurrent Aphonia. DR. ADOLPH WEIZENHOFFER.

This patient is presented to you not because she shows any unusual or striking condition; but for etiological study. The diagnosis is intentionally provisional and is open to modification or change.

This girl is 19 years old, domestic by occupation. At the age of 6 she fell five flights of stairs. One week later her right arm was paralyzed, after another week her right leg was also involved. She remained in bed two months and was left with a partial paralysis of arm and leg with hypertonicity. Otherwise she had no serious illness. She has been subject to frequent attacks of sore throat since childhood but has had no hoarseness until six years ago, since which time she has had six attacks of aphonia.

The onset is not always accompanied by cold. She has had two attacks in summer and four in winter. The first two attacks lasted each two weeks and were treated at a hospital by inhalations with complete recovery. The third attack lasted one week and got well spontaneously. The fourth attack lasted eight weeks. At a dispensary topical applications were made which brought the voice back for one hour; she then relapsed and finally recovered spontaneously. The fifth attack lasted four weeks. Her faucial tonsils were removed under general anesthesia with complete relief for three months. At this time, February, 1920, her present attack began.

She is markedly aphonic and has been so throughout her attack. She has no pain or sore throat, and while talking she has a short dry cough. For the past ten days she has complained of pain in the muscles of the neck, worse on the left side. This happened also during one of her previous attacks. There are a few enlarged cervical glands.

Examination: Lungs are negative on physical examination and X-ray. Wassermann is negative and there is no history of luetic infection.

Neurological examination shows no evidence of hysterical stigmata. There is a residual paralysis of the right hand and foot with hypertonicity and athetosis.

Ears: Both drums are slightly retracted, otherwise normal. Hearing in the left ear is normal. The right ear shows complete loss of both air and bone conduction. This deafness dates from the time of the fall. Lateralization is to the left ear. With the cold caloric test, both ears show normal nystagmus.

The nose shows no abnormality.

The throat shows only enlarged lingual tonsils.

In the larynx there is an infiltration of the interarytenoid sulcus. The epiglottis, arytenoid cartilages, aryteno-epiglottic folds and vocal cords appear normal in color, and there is neither infiltration or ulceration. On phonation both cords move, but do not approximate. In view of the fact that removal of the faucial tonsils gave relief lasting three months, her lingual tonsils were removed under local anesthesia; but without effect on her aphonia.

In making a diagnosis seven conditions must be thought of, *viz.*, hysteria, simple chronic catarrh, new growth, pachydermia, tuberculosis, syphilis and paralysis.

That the aphonia is not purely hysterical or a hysteria superimposed on an organic lesion of the larynx is established by the neurological examination.

Simple catarrh is more apt to involve the whole larynx and not confine itself to the interarytenoid space.

Malignant growth can be ruled out by the age of the patient, the duration of the disease and the location; malignancy rarely involving the posterior wall alone. Benign tumors are rare in this region.

Pachydermia is frequently situated in the interarytenoid space and may interfere considerably with the movements of the vocal cords.

The history and absence of pulmonary symptoms excludes tuberculosis, both secondary and primary, interarytenoid infiltration alone being a common sign of laryngeal tuberculosis in its early stages only.

Syphilis produces hyperplasia of the interarytenoid mucous membrane; but only early in the disease.

As stated previously both cords move through a considerable arc, but fail to approximate completely. This excludes paralysis.

In view of all the facts it seems that the most probable cause of the aphonia is pachydermia laryngis.

DISCUSSION.

DR. J. H. ABRAHAM said that the question of aphonia had interested him for years, and that it occurs in young females most frequently. Another factor seemed to be occupation. He had had ten cases in school teachers, young women between eighteen and thirty. The second greater number result from accidents. As for pachydermia producing aphonia, he did not think that was so; it might produce a huskiness, but not aphonia. Dr. Hubby had eliminated the hysterical element. Then the question of therapy comes up.

Dr. Abraham said that he had found in these young women that one should try to eliminate certain secretal and other causes—young colored females are very apt to have various love affairs; second, monetary affairs; third, shock—all these have to be eliminated; also gastro-intestinal conditions and auto-intoxications. Ordinary simple local treatment combined with suggestive treatment has proven most effective in these cases.

DR. HARMON SMITH agreed with Abraham in regard to hysteria as the cause in the majority of these cases, but called attention to the fact that in this case the patient had had a previous paralysis of the right side, while the injury from which she had suffered was on the left side of the head. It was quite possible that she had had either a depression of the skull or a hematoma over the pre-central lobe of the left side of the brain, which is the speech center. Ordinary aphonia is not due to true paralysis, and while a thickened inter-arytenoid space will often prevent the cords from coming together so as to make a perfect sound, yet they will almost invariably allow the cords to approximate sufficiently to make some sound. Dr. Smith said that in his opinion the patient had some trouble in the speech center.

Hereditary Telangiectasis of the Nose, Tongue, and Palate. DR. JACOB BRAUN.

DISCUSSION.

DR. ABRAHAM recalled a case seen some ten or twelve years ago. The patient was a woman of high standing referred to him by Dr. Brooks Wells, who during her pregnancy developed an attack during the fifth month. The lesions were on the mucous membrane and the skin. She became pregnant three times and had attacks of this kind each time. Dr. Abraham said he had not gone into the history of the children.

DR. HARMON SMITH said that he wished to congratulate the Doctor upon the complete and delightful presentation of his report, and that he wished to add thereto a brief report of two cases and observation upon a third, which had occurred in his practice.

About fifteen years ago an Englishman, while sojourning in this country, began to develop petechia not only over the skin of his body, but upon the lips and buccal mucous membrane. Some of them assumed the size of a small pea. In ascertaining his history he found that he was given to drinking daily port wine both for his luncheon and dinner. By cutting him off from his wine drinking and giving him internally supra-renal gland he recovered in about three weeks.

The second case was that of a woman about 26 years of age who was referred to him by Drs. McClellan and Steiner of Hartford, Conn. In this case telangiectasia could be traced back for four generations. She

had been bleeding, more or less, from the nose over a period of ten years, occurring from once a week to once a month. Worry or excitement would often bring these hemorrhages on. The cheeks, chin, mucous membrane of the lower lip, the tongue and buccal mucosa showed petechia from the size of a pin head to a split pea. He referred her to Dr. Dwyer, of Columbia University, for examination of the blood, a partial report of which follows: "Wassermann negative. Coagulation time 14 minutes. Prothrombin normal. Ant-thrombin not demonstrable." Dr. Dwyer expressed an opinion that the blood findings showed the patient to be a hemophiliac with some characteristics of a purpura.

In writing to Drs. McClellan and Steiner he suggested that in addition to the ordinary iron and arsenic treatment that they should use coagulose either subcutaneously or intravenously, and with proper precautions against anaphylaxis, horse serum. If this failed, blood transfusions from some person who had better blood with a less coagulation period.

Dr. Steiner reported this case in a series of cases of this nature some years ago and in his report stated that the severity of the hemorrhages and their frequency had increased and that cauterization and other measures had been of but little avail.

Dr. McClellan, under whose special care the patient had been for some time, had used all forms of cauterization from silver nitrate to the electric cautery, and had noted that from the spots cauterized there had never been any further bleeding. He also, called attention to the fact that she would frequently bleed within the cavity of the antrum, which would only control itself when the antrum was filled and from the pressure of the blood clot. He trans-illuminated after several such hemorrhages and found the antrum dark, but in the course of a week the blood would become absorbed and no shadow remain.

He had not heard further concerning the outcome of the case after the institution of the treatment recommended.

The third case was one which had come under his observation in the Clinic at the Manhattan Eye, Ear and Throat Hospital, which bore some relation to the clinical aspects of the cases just cited. He did not remember the history of the case, as the patient disappeared soon after being placed under treatment. He remembered, however, that supra-renal gland in capsule form was given two or three times a day.

Sarcoma of the Nasal Chambers. DR. GEO. D. WOLF.

A. J. G., male, 47 years, United States painter. Came to the Harlem Hospital, O. P. D., on August 27, complaining that for the past three or four months he had noticed a gradual obstruction of his left nose, becoming complete within the past few days. He also had a disagreeable taste in his mouth, and a malodorous discharge from his nose. For the past week he had a severe left-sided frontal headache. There was no history of epistaxis or loss of weight.

Family History: Father died at 54 from heart failure; mother, 73, alive and well; one brother died at 14 months from hydrocephalus; two sisters and one brother alive and well. No history of malignancy in the family.

Past History: Ordinary diseases of childhood; pneumonia at 14, erysipelas of the leg at 33 years of age. He has had a chronic, persistent, hacking cough, which he dates back to his attack of pneumonia. Had an intranasal operation about thirty years ago, after having been hit by a baseball bat. Venereal history denied.

He cannot recall any particular trauma to his nose, except the accident mentioned of thirty years ago, and a fight two years ago, resulting in a swelling of the left cheek and echymosis of the eye on the same side.

On December 19, 1919, he fell off a scaffold, causing a fracture of two ribs. He was unconscious after the accident, and cannot state whether his nose was injured or not.

Habits: He was a heavy drinker until about a year ago, but drinks very moderately since. Does not smoke or chew. Eats and sleeps well.

Physical Examination: Poorly nourished; skin of pasty appearance,

and complexion sallow; eyes present slight exophthalmos. Dalrymple, Graefe and Stellwag signs are present; double dacryocystitis, but more marked on left side; fundi, negative. Nose: Septum markedly deviated to right and adherent to the inferior turbinate of that side. Left side, none of the usual landmarks are to be made out. The whole naris is filled with an irregular mass, pinkish in color, which is soft in consistency. A retro-pharyngeal examination showed this mass to fill the posterior naris. There is tenderness over the left frontal sinus and Ewing's sign is present. Pressure elicits but slight tenderness. The submaxillary and cervical glands are not palpable.

Pulse 110, regular and of good quality. Weight 127 pounds. Blood, Wassermann, negative, Hgb. 75 per cent; R. B. C., 3,480,000, W. B. C., 13,600; Polys, 77 per cent; Lymph., 23 per cent. Urine, negative.

Dr. Wm. H. Stewart reports the following roentgenographic findings: "The air sinuses of the entire left side show involvement of some process, which has almost completely obliterated the cavities. The character of the shadows would seem to indicate some solid body more than a fluid. The lower part of the left antrum still contains air. The left side of the nose is completely blocked, and we are unable to map out any outline of the turbinates. I am suspicious that there is also some involvement of the ethmoidals on the right side. They lack the clear detail one would expect with normal cells. Chest negative."

The suspicion of malignancy was aroused when slight manipulation of the growth by probe resulted in profuse hemorrhage and patient had to be sent home and advised to report again. When he presented himself the second time, within a few days, his sub-maxillary glands were found to be enlarged.

Specimen was removed from nose and submitted to Dr. T. A. Gonzales, who reported as follows: "Several small pieces of tissue, which on cut section show a homogenous., yellowish white surface. Nothing of interest grossly. Microscopic section: Shows area of small, with slightly irregular-shaped nuclei. The cells have a small amount of plasma and the nuclei are rich in chromatin. In some spots there are numerous mitotic figures showing active growth. The cells are slightly larger than the ordinary lymph cells. The whole tumor is made up of these cells held together by a fine, fibrous stroma, which in some places is hardly discernible. Here and there a new formed blood vessel is made out. There is no regular arrangement of cells. Diagnosis: Round cell sarcoma.

Shortly after the removal of the pieces, patient ceased to visit the Clinic. On visiting his home, the patient stated that he felt much better and was able to breathe through the obstructed side, and therefore did not care to lose any more time from his work. Only by intimating to him the gravity of the ailment was he induced to return for observation and treatment. He was advised to submit to radium, and was referred to the Memorial Hospital on Dr. Janeway's service, where he received two exposures on December 11 and 12, respectively.

Death During Bronchoscopic Attempt of Removal of Tack in a Case of Status Lymphaticus. DR. LESTER MEAD HUBBY.

J. J., female, age 4 years, 6 months, negress. Admitted to the Harlem Hospital February 27, 1920.

No family history of tuberculosis or syphilis.

Pneumonia one year ago. No childhood diseases. Fractured femur in 1917. Operation on both tibiae for bowing in 1919.

Subject to poor appetite and constipation.

In May, 1919, swallowed an upholsterer's tack, one with a brass head with rounded top. She had no symptoms of discomfort following this until nine months later.

Early in February began to have cough, fever, dyspnea and loss of weight. Three weeks later admitted with diagnosis of empyema of the chest, right side.

Physical Examination: Poorly nourished colored girl. Teeth, fair condition. Chest poorly developed. Lungs, dullness over the right side and a few crepitant rales over this area. Heart and abdomen negative. Extremities somewhat rachitic. Urine negative. No pus or fluid found on tapping the right pleural sac.

X-ray taken of chest showed a tack in the right bronchus, head down and shank pointing upwards and slightly forward. The lung beneath tack level appeared drowned in fluid.

Throat culture negative for Klebs-Loeffler bacillus.

March 1 made first attempt to extract tack through bronchoscope using the Kahler 7 mm. tube. Started with chloroform anesthesia but the respiration at once became very feeble, so it was discontinued and the search continued without anesthesia. Considerable pus and fibrin found in the right bronchus. Point of tack found and grasped but tack was so firmly fixed that it could not be moved, the forceps repeatedly slipping off.

The next day she seemed none the worse for the instrumentation.

The daily temperature range was between 100 and 103° Fahrenheit, but during the following three days it did not exceed 101.2°.

A second X-ray was taken and apparently revealed a pneumothorax of the right side with collapsed lung. This, however, was not shown at the autopsy.

March 4 another attempt was made to extract the tack.

A very slight preliminary chloroform anesthesia was given simply while beginning the insertion of the tube. Ten per cent novocain and adrenalin were applied several times to the congested bronchus to stop coughing and secretions. Had the same difficulty as at the first attempt. The right bronchus was flooded with pus, which was aspirated frequently.

After a half hour's attempt to dislodge the tack and while the breathing and heart action seemed regular and not weakened, the breathing suddenly stopped absolutely. Artificial respiration, oxygen inhalations, stimulants did not have the slightest effect.

Abridged Autopsy Notes of Dr. Gonzales: Emaciated colored child. Age 4½ years, weight 30 pounds, height 3 feet. Thighs distinctly bowed, beading of ribs, epiphyses slightly enlarged. No free fluid in the peritoneal cavity. Diaphragm on right side lower border of fifth rib, left side upper border of sixth. Lungs, right lung collapsed, adherent posteriorly. Left lung normal in size. No free fluid in pleural cavity on either side. Thymus consists of two lobes, right larger than the left. Right 3½ inches in length, ½ to 1½ inches in thickness; left, 1½ inches in length, ½ to 1½ inches in thickness. It was made up of thymus tissue and fat.

Larynx normal. Trachea filled with mucopurulent material. Left bronchus the same. Right bronchus at beginning contains a tack, very much rusted, the head inferiorly. Tack surrounded by muco-purulent material. Head imbedded in yellowish pus. Nearly complete obliteration of bronchus. Lungs unaerated. Diffuse suppurative bronchitis and peribronchitis. Bifurcation of right bronchus. Upper branch completely obliterated and the lower one filled with pus. Lower bronchus just below costriction is markedly dilated. Right lung on section is studded with abscess cavities. Bronchiole walls thickened and on pressure exude pus. Left lung base congested, cut surface dark red, partially aerated. Heart enlarged. Right cavity markedly dilated and filled with fluid blood. Left cavity contracted. No valvular lesions. Fossa ovalis closed. Stomach filled with gas and one ounce of brownish fluid. Mucous membrane normal. Small intestines normal throughout. Large intestine shows some enlarged follicles at lower end. Liver normal in size and form. Cut surface smooth and congested. Gall bladder contains half ounce of brown bile. Spleen enlarged, capsule tense, Malpighian corpuscles markedly prominent. Adrenals normal in size, cortex thin. Kidneys. Capsule strips easily leaving a smooth surface. Kidney tissue firm, markings well preserved. Pelvis and ureters normal. Bladder contains one ounce of urine. Uterus and tubes normal.

Cause of death: Foreign body in bronchus. Suppurative bronchitis, bronchiolitis and bronchiectasis. Status lymphaticus.

Other anatomical lesions. Complete carnification of right lung. Dilated right heart. Congestion of liver and kidneys. Septic spleen. Hypertrophy of lymph follicles of spleen. Hypertrophy of lymph follicles at base of tongue, intestines and mesenteric lymph nodes.

DISCUSSION.

DR. IMPERATORI did not think that this was a case of death due to status lymphaticus and agreed with Dr. Lynah that it might be due to the various other pathological conditions noted and helped largely by the pneumothorax. In preparing a thesis for a national society some few years ago—experimentation on animals showed that the tip of the bronchoscope touching the carina produced various disturbances in the respiratory and cardiac centres. Pneumothorax produced by the bronchoscope would cause death in animals within five minutes.

The point brought out by Dr. Lynah about the direction of the bronchoscope was very important and it was well to have one's attention directed to it.

Dr. Hubby used a different type of bronchoscope than that used by Dr. Lynah .

DR. FORBES said he thought Dr. Imperatori meant to speak of the question of the general anesthetic. That was a point on which all must agree, that when a child had been through so much, we should hesitate to give an anesthetic, unless, perhaps, to cocainize at the bifurcation when that was reached.

DR. IMPERATORI said he had meant to speak about anesthesia. In his opinion the majority of cases that are bronchoscoped may be done under local anesthesia in adults and under no anesthesia in children.

Following the method of Dr. Freudenthal, of first cocainizing the tongue and then the method of Dr. MacKenty of using a fine spray within the trachea and on the carina, a very good anesthesia can be obtained within five minutes. A ten per cent cocaine solution is used.

Esophagoscopy can be done with no anesthesia at all. It is simply a question of familiarity with the parts to be examined and a proper technique.

We should not use chloroform at all; for should the case be one of status lymphaticus, chloroform anesthesia lessens the safety and increases the risk for any patient taking any anesthesia.

DR. ABRAHAM spoke of the very satisfactory results he had from using hyoscin, and asked if others were using that now.

DR. FORBES said that he was using it now, morphine, and atropin half to one hour before operation, both in laryngoscopy, bronchoscopy and esophagoscopy in adults.

Death Following Injections of Novocain. DR. FRANCIS W. WHITE.

I had never seen the patient before the onset of the convulsions but feel that cases of fatalities from local anesthesias should be reported and, as this occurred in the Clinic, I am taking the opportunity of placing it on record.

The patient, a woman aged 23, rather heavy set, was prepared for local tonsillectomy without the previous use of morphin as follows: The tonsils, pillars, and pharynx were swabbed with 20 per cent solution of cocain with 10-15 drops of 1-1000 adrenalin to the ounce. This was followed in about ten minutes by the injection of a 1 per cent solution of novocain. About three drachms of the solution was drawn up into the ordinary type of syringe used for this purpose, and the injection was made in the usual sites on the right side, and about the same amount was injected on the left side. About fifteen seconds after the last injection, the patient, with an exclamation, reeled forward in convulsions. Cyanosis was marked. The patient was laid flat on her back on the floor, the sphincter ani dilated, and artificial respiration begun, but the convulsions persisted and cyanosis was still very marked; the pupils were semi-dilated, the pulse very faint, and the respirations shallow. The

heart was massaged, ether and adrenalin given subcutaneously, and the use of the pulmotor was instituted. The convulsions ceased, no respiration was evident, and there was no perceptible heart beat nor pulse. The artificial respiration was continued for about an hour, at the end of which time the patient was pronounced dead.

There was no apparent cause for the condition. At the post mortem all the organs were found normal, excepting the thymus which weighed about 50 grammes.

Diagnosis: Status lymphaticus.

DISCUSSION.

The report of the Committee on the advantages and disadvantages of the various anesthetics in nose and throat work was published in the Journal of the American Medical Association and in THE LARYNGOSCOPE. Only one case of idiosyncrasy was reported and in this instance the patient had a pre-existing neurosis. In the summary, the report states that the synthetic products are not equal to cocain in local effects and they may be used in unlimited quantities if injected slowly. Fatalities, if they occur, do so immediately, the great danger being in the too rapid injection or the entering of a vein. Idiosyncrasy does exist, and the previous administration of morphin requires further investigation.

This patient had no morphin.

DR. DAVID H. JONES said that after this case occurred he looked up the literature and found that the largest amount administered was 250 c.c. The latest reports say that there are cases which have a peculiar idiosyncrasy against novocaine; according to the government reports, they have been tested on animals, etc. The quickest stimulant on record now for all cocain poisons is ether by inhalation.

DR. UNGER said that novocain is one-eighth as toxic as cocain, and if the injections are limited to ¼ grain then injections of novocaine should be limited to 2 grains, which would give very much less than the 24 c.c. of the one per cent solution that was used in the case. Most men limit themselves to 8 c.c. of a ½ per cent solution.

DR. MCCULLOUGH remarked that there was no doubt an excessive amount had been used.

A Case of Internal Pachy-meningitis, Leptimeningitis, Pansinusitis, Cavernous and Lateral Sinus Thrombosis. DR. L. M. HUBBY.

W. R., age 36, Negress, married. Family history negative for tuberculosis, malignancy, syphilis, etc.

Most of previous history unobtainable. According to her son she had been suffering with nasal discharge, especially from the left side, for over a year. Said to have been troubled with anorexia, constipation and insomnia during that period.

Has one child—a son—who appears healthy.

History of any miscarriages unobtainable.

For one week prior to admission had indigestion, no epistaxis, continuous headache and fever. One day previous to admission became semicomatose and restless and a rash appeared on the body.

Admitted to the Harlem Hospital October 17, 1920.

Physical Examination: Fairly well nourished, comatose, restless, delirious, subsultus tendinum, carphology. Sordes present. Ulcerative erosion of left ala nasi near the labial fold, about eight millimeters in diameter. Petechial rash on chest and abdomen. Temperature 104° Fahrenheit, pulse 140, respiration 28. Eyes, right pupil dilated and did not react to light. Fundi normal (Martin Cohen). Neck, considerable rigidity. Lungs, heart, abdomen and extremities negative. Slight Koernig, no Babinski. Patellar reflexes not exaggerated. No ankle clonus.

Examination of the cerebrospinal fluid, spurted out under markedly increased pressure. Very cloudy. Thirteen hundred cells to the cubic millimeter, mostly polymorphous nuclears. Gram positive diplococci found on smear morphologically the pneumococcus. Sugar reaction negative.

Carbon dioxid combining power equals 6 c.c. per 100 c.c. of fluid.

Protein precipitation. Sulphosalicylic acid, 6.2 m.m. (1+). Mercuric chloride, 4.8 m.m. (1) Phenolphthalein, colorless. Urine. Dark brick red. Sp. grav. 1022, moderate amount of albumin. Glucose, faint trace. Acetone and diacetic acid negative. Many medium and large-sized granular casts.

Blood Examination: Erythrocytes, 3,160,000; haemoglobin, 65 per cent. Leucocytes, 26,000; number of cells counted, 100; polynuclears, 92 per cent; transitionals and lymphocytes, 8 per cent; no plasmodia malaria; clotting time method, 2½ minutes; bleeding time, 3 minutes.

Seen by me on the following afternoon.

There was now marked exophthalmos of the right eye not noticeable in the left. Chemosis marked in the right and slight in the left eye.

Marked rigidity of the neck. Rather flaccid right arm. Slight Koernig, no Babinski. Soles of feet seemed insensitive. Patellar reflexes about normal. Very slight suggestion of ankle clonus.

Abdominal wall reflexes absent.

Right nasal chamber nearly clear and a trace of pus under the middle turbinate only demonstrated with hydrogen peroxide. No edema or turgescence of the middle or inferior turbinates.

Left nasal chamber not quite so clear. Pus under the middle turbinate more readily demonstrated with hydrogen peroxide. No edema or turgescence of the middle or inferior turbinates.

Ears. External canals and membrane tympani normal. No swelling along the internal jugular veins.

Diagnosis: Pneumococci cerebrospinal meningitis, pansinuitis? Cavernous thrombosis.

Autopsy Notes of Dr. Gonzales: Body of a well nourished negress, 5 feet 6 inches in height. Weight 145 pounds. Pupils equal. Distinct exophthalmos of the right eye. Scalp and skull normal.

Dura: Left lateral sinus and left sigmoid sinus and left cavernous sinus thrombosed but not purulent. Between dura and arachnoid on both sides is a layer of pus yellow in color. The subarachnoid over the vault and base shows an exudate of pus. The exudate is distinctly purulent.

After removing the dura and breaking the posterior wall of the frontal sinuses—the left sinus shows a greenish yellow pus—the right sinus contains a slimy muco-purulent fluid. The ethmoids and the sphenoids also show this fluid. The inner wall of the right orbit over the posterior ethmoids is very thin and in one spot necrosed through. The posterior portion of the right orbital fossa contains about 3 s.s. of pus.

The external, middle and internal ears are normal.

The spinal canal: There was some pus between the dura and the arachnoid and the subarachnoid space is filled with a bloody purulent fluid. The lumbar region also shows a purulent fluid.

Diagnosis: Acute pneumococcic pachy, and lepto-meningitis. Pansinusitis. Cavernous and lateral sinus thrombosis.

Comments: Internal pachymeningitis is rather a rare condition according to Osler and is usually secondary to a leptomeningitis.

In this case the pneumococci may have traveled through the lymph spaces in the arachnoidal mater or they may have penetrated the dural sheath of the optical nerve to the subdural space and passed to the subarachnoid space secondarily. This can happen without noticeable optical disc changes.

The thrombosis in the lateral and cavernous sinuses was a late complication, no symptoms appearing until about twelve hours previous to death and there was no chill during the illness. No blood culture was taken.

The infection in this case may have reached the cavernous sinus through the pterygoid plexus of veins reaching the latter from the nose by the spheno-palatine vein or may have been secondary to the meningitis reaching the pterygoid plexus through the middle meningeal vein and then passing to the cavernous sinus.

The exophthalmos of the right eye was produced by the postorbital pus and cellulitis.

The exophthalmos of the right eye was produced by the postorbital pus and cellulitis.

The slight exophthalmos of the left eye was due to the venous engorgement from the cavernous sinus thrombosis.

The Snaretome Operation for the Removal of Tonsils Under Local Anesthesia. DR. JACOB BRAUN.

(To be published in a subsequent issue of THE LARYNGOSCOPE.*)*

Peritonsillar Abscess and Its Radical Treatment. DR. ISAAC M. HELLER.

DISCUSSION.

DR. J. G. CALLISON said that anyone who had been through a peritonsillar abscess would know the difficulty of ingesting even water. In a few days the water hunger is so marked that it becomes oppressive. In the average case of ether anesthesia, thirst and water hunger is one of the disagreeable post-operative conditions, and he wished to know if in this operation with a water hunger already present, any steps were taken to provide the needed fluids.

DR. UNGER asked if Dr. Heller had considered the question of pulmonary embolism in the case of the child that died. He then cited the case of a peritonsillar abscess operated by another physician after the radical manner described by Dr. Heller in which the tonsil was removed and later a one-sided cellulitis of the throat and cheek developed which lasted for over ten days, being accompanied by fever, chills and great prostration so that the patient almost died and the recovery was very long and tedious.

DR. MCCULLAGH expressed the opinion that the procedure advocated by Dr. Heller was a dangerous one and not good surgery. The fact that some peritonsillar abscesses were not properly opened and good drainage secured was not a sufficient reason for such a radical procedure.

In certain cases the removal of the tonsil on the affected side might be justifiable, but removal of the other was merely exposing the patient to unnecessary operative and post-operative risk.

DR. HELLER replied that he realized as well as anyone that the method he advocated was different from that generally followed, and he might be wrong. If so, he was willing to be convinced but naturally everyone judges by his own experience and his had been very satisfactory excepting in the two cases, which should not have been touched. The second was similar to Dr. Carter's case and seemed to be status lymphaticus. The child had nothing in his throat, the heart was clear and all right for two hours. Still, there might have been an embolus.

As to abscesses of dental origin he had no thought of operating on them, and he had yet to see a case of quinsy where the mouth could not be opened sufficiently to throw in a light and make a diagnosis, and if there was any doubt it would disappear when the anesthetic was given and the throat ready for operation. As to the dryness he had not had much experience. In one or two cases where the patients complained they were given the Murphy drip and made comfortable.

As to the procedure not being surgical, he begged to differ with the Chairman. There is no operation in which we do not cut through normal tissue, in a cellulitis of the arm, for instance one cuts through normal tissue, in a cellulitis of the arm, for instance, one cuts through normal tissue, and the same is true in other parts of the body. After you have gotten out the pus there is no place for it to accumulate. There is a big open surface which granulates shortly afterward and protects it. So even if we do have to cut through normal tissue, we are not doing anything more than in surgical cases elsewhere.

Dr. Heller repeated the fact that he had said the pus was easiest reached from above, but said that he dissects the anterior pillar away, which exposes the entire anterior surface of tonsil; then anterior pillar is retracted, and dissection carried up over the dome of the tonsil. Then he puts the tube in the cavity, and every particle of pus is sucked out. The objection in the ordinary cases does not obtain here inasmuch as it is sucked out in the one and in the others left to drain through a small stab incision.

A DIAGNOSTIC SIGN IN PROGRESSIVE DEAFNESS.

Dr. Jesse Wright Downey, Baltimore, Md.

The term progressive deafness is here used in its symptomatic sense rather than to define a pathologic entity, and is, therefore, intended to apply to all cases of increasing deafness in which the predominant lesion is apparently within the conduction apparatus, but for which little or no cause, either local or general, can be clearly established.

Though all such cases may be loosely classified as oto-sclerotic in character, very few present the complete symptom-complex of oto-sclerosis and each must necessarily exhibit individual variations of type; it is, therefore, often difficult to reach a conclusive diagnosis on which a justifiable prognosis can be based.

In the author's practice the following simple procedure and its resulting reaction has seemed both of diagnostic and prognostic value in a creditable number of patients treated for what may be clinically designated, progressive deafness.

The electrically lighted otoscope, with the massage bulb attached and held collapsed, is introduced snugly into the external auditory canal and so adjusted that the flaccid membrane and the handle of the malleous can be plainly seen. The bulb of the instrument is now allowed to fill with air, the drumhead being kept under careful observation as the suction is exerted upon it.

1. If there follows an immediate filling up of the vessels, so that a network of small arteries can be easily traced in the superio-posterior canal wall, in the flaccid membrane and along the posterior border of the malleous handle, and if this hyperemia can be markedly increased by a few seconds of gentle massage, we are probably dealing with a pathologic process in which there has been little or no permanent circulatory disturbance. Inflation, followed by gentle massage, is beneficial in these cases.

2. If *no* hyperemia can be produced by negative pressure or by a few seconds of massage, the disease present is in all likelihood a true oto-sclerosis with beginning anklosis of the stapedial articulation, spongification within the labyrinthine capsule, and actual arterial changes probably of a sclerotic nature. Massage in these cases is *not* beneficial and may prove harmful.

The diagnostic value of these observations is, of course, mainly corroborative, the prognostic possibilities seem of greater usefulness. If no tympanic congestion can be produced, the hearing and vestibular tests will, as a rule, show that there is a reduction both in the cochlea and static function. If hyperemia can be produced, slight improvement in hearing may be attained by judicial treatment though a mild labyrinthine involvement is demonstrable.

One is hardly at liberty in this era of medicine to present clinical observations without confirmatory pathological reports. There is a sufficient anatomical basis, however, for the assumption that changes in the external arteries of the tympanic membrane are significant of similar changes in vessels of both the tympanum and the labyrinth as a free anastomoses between these vascular networks has long ago been demonstrated. Vascular changes, of one kind or another, have been noted in many pathologic reports concerning the findings in oto-sclerosis. Mayer lays stress on the sclerotic changes in the arteries.

In conclusion I wish to call particular attention to an article by Dr. B. Alexander Randall, "The More Efficient Method of Aural Massage" (Annals of Otology, Rhinology and Laryngology, September, 1911). Assuming that every effort has been made to determine the etiology and to eradicate every contributory cause, in my opinion, no more logical local method of treatment for progressive deafness has been advised than that laid down by Randall in the paper mentioned.

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